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REVISION OF THE HAWAIIAN SPECIES OF EUPHORBIA L.[1]

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INTRODUCTION

The vast size of the genus *Euphorbia* has perhaps deterred students of the Hawaiian flora hitherto from attempting a revision of its Hawaiian species. The conflicting views regarding the integrity or unity of *Euphorbia* as a genus in the broad sense employed, for example, by Boissier *(in* DeCandolle, Prodromus **15**, pt. 2. 1862), have doubtless contributed in no small measure toward the same result. In studying the literature on *Euphorbia* and the numerous proposed segregates, I have been impressed with the interrelation of these two factors. *Euphorbia* (using the name always in its broader or Boissieran sense), by the very reason of its vastness, affords such internal diversification as to suggest various generic segregations, at the same time displaying so many intergradations among the suggested segregates as to make questionable the wisdom of their establishment.

Realizing that generic as well as other taxonomic concepts are to a great extent necessarily subjective, I have consulted not only all available specimens but also the opinions, both oral and published, of many taxonomists who have given *Euphorbia*

[1] Issued December 27, 1937.

particular attention. In a general way it has seemed that the more cosmopolitan one's studies in the genus have been, the less disposed or able he has felt to resolve *Euphorbia* into an assemblage of distinct genera. Accordingly, it would appear that in the present state of our knowledge the ends of prudence and conservatism are best respected by retaining as sections of *Euphorbia* a number of subgroups segregated by some writers as genera (e. g., *Anisophyllum, Poinsettia, Tithymalus).* In this connection, however, we may note the position taken by Otto Degener, author of the currently appearing *Flora Hawaiiensis.* Mr. Degener, who, incidentally, maintains such groups as *Poinsettia* and *Tithymalus* as distinct genera, writes me that he believes the native Hawaiian species of *Euphorbia* to be capable of segregation. He proposes to describe soon a new genus, this to include all the native Hawaiian species, varieties, and forms given in the following pages. Whether Mr. Degener's view will eventually be embraced by conservative taxonomists, time alone can reveal. His view was known to me, however, several years ago and has been kept in mind throughout my studies.[1] It would seem to me that at the most, and perhaps only in an arbitrary way, the native Hawaiian species could be made to constitute an additional section of *Euphorbia,* standing next to the section *Anisophyllum.* (In Boissier's classical treatment, the native Hawaiian species known to him were placed in sect. *Anisophyllum,* subsects. *Gymnadeniae* and *Sclerophyllae.)*

Several years ago, the large collection of native and introduced species of *Euphorbia* and other genera of the Euphorbiaceae belonging to the Bernice P. Bishop Museum of Honolulu was sent to me for study. This was later supplemented by the still larger collection belonging to Mr. Degener. Both collections included a large quantity of unmounted duplicate material, intended for subsequent distribution and, in the case of

[1] Since the above text was written, Mr. Degener has joined Leon Croizat (Degener, Fl. Haw. Dec. 9, 1936 [originally misprinted November 9, 1936]) in referring all the Hawaiian endemic species to *Chamaesyce.* The new nomenclatural combinations arising from this treatment have been inserted as synonyms in my text, without comment.

the Degener plants, often reaching a total of a dozen or more specimens for a single number. From time to time, through the friendly cooperation of the authorities at Field Museum of Natural History, Chicago, where primarily my work has been carried on, the collections of many of the principal European and American herbaria have been borrowed for examination. In this way it was possible to study directly almost all of the types of the previously described Hawaiian species and varieties of *Euphorbia*. In the very few cases where types, also original descriptions, were inacessible to me, the attendant difficulty has been surmounted through the exceedingly kind assistance of those in charge of certain herbaria and libraries.

To the institutions which, by the cooperation of their directors or staff members, made this revisional study possible, it is a pleasure to acknowledge here my deepest gratitude. Particularly must I express my indebtedness to the following individuals: Miss Ethelyn M. Tucker, Librarian, Arnold Arboretum; Dr. Ludwig Diels, Director, and Dr. Johannes Mattfeld, Curator, Botanical Garden of Berlin; Dr. Herbert E. Gregory, formerly Director, Dr. Peter H. Buck, present Director, Mr. Edwin H. Bryan, Jr., Curator of Collections, and Miss Marie C. Neal, Botanist, Bernice P. Bishop Museum; Dr. John Ramsbottom, Keeper of Botany, British Museum of Natural History; Dr. Karl M. Wiegand, Professor of Botany, Cornell University; Mr. Otto Degener, author of the *Flora Hawaiiensis;* Dr. B. P. G. Hochreutiner, Director of Botanical Garden of Geneva and of Delessert Herbarium; the late Mr. Stephen C. Simms, formerly Director, Dr. B. E. Dahlgren, Head Curator of Botany, Mr. Paul C. Standley, Curator of the Herbarium, and Mr. C. H. Carpenter, Photographer, Field Museum of Natural History; Dr. Carl Skottsberg, Director, Arboretum of Gothenburg; Dr. Elmer Drew Merrill, Administrator of Collections, and Mr. Charles A. Weatherby, Assistant Curator at Gray Herbarium, of Harvard University; Sir Arthur W. Hill, Director, and Dr. J. Hutchinson, Botanist, of the Royal Botanical Gardens of Kew; Dr. Boris Keller, Director, and Dr. V. P. Savicz, Assistant Director, Botanical Garden of Leningrad; the late Dr. Marshall Avery Howe, formerly Director, and Dr.

Henry Allan Gleason, Deputy Director and Head Curator, New York Botanical Garden; Dr. Henri Humbert, Director, Museum of Natural History, Paris; Dr. William R. Maxon, Associate Curator, United States National Museum; Dr. Karl Keissler, Director of the Department of Botany, Natural History Museum, Vienna.

In the foregoing list I have purposely omitted the name of Dr. Jesse More Greenman, in whose honor the present volume is being published and to whom I would here tender special thanks. As one of Dr. Greenman's earliest students in plant taxonomy, it is with a deep sense of gratitude, not only for his aid in lending specimens for the study here represented but for his wise direction and friendly counsel in former years, that I join some of his later students in seeking here to pay him tribute.

I have photographed upwards of one hundred of the more important specimens studied. Complete sets of the photographs are in my private collection and in the herbarium of Field Museum of Natural History, Chicago. These photographs have been drawn upon exclusively for the accompanying plates.

Wherever the term "cotype" is used in the legends accompanying the plates, or elsewhere in the text, it is used to connote a duplicate of the type, as shown, for example, by the use of the same collection number.

Names of institutions or individuals at present possessing the specimens cited in this Revision (and referred to in the text usually by the names or abbreviations in parentheses) follow: Botanical Garden of Berlin (Berlin); Bernice P. Bishop Museum, Honolulu (Bishop); British Museum of Natural History, London (British); Cornell University, Ithaca (Cornell); Mr. Otto Degener, Waialua, Isl. Oahu (Degener); Delessert Herbarium, Geneva (Delessert); Field Museum of Natural History, Chicago (Field); Botanical Museum of the University of Florence (Florence); Arboretum of Gothenburg (Gothenburg); Gray Herbarium of Harvard University, Cambridge (Gray); Royal Botanical Gardens of Kew (Kew); Botanical Garden of Leningrad (Leningrad); Linnean Herbarium, Lon-

don (Linnaeus); University of Minnesota (Minnesota); Missouri Botanical Garden, St. Louis (Missouri); New York Botanical Garden, New York City (New York); Museum of Natural History, Paris (Paris); Academy of Natural Sciences, Philadelphia (Philadelphia); United States National Museum, Washington, D. C. (U. S.); Natural History Museum, Vienna (Vienna).

Genus EUPHORBIA L.

EUPHORBIA L. Gen. Plant., edit. 5, p. 208. 1754.

Herbs, shrubs, or trees, of widely diverse habit, with milky juice, our species leafy; leaves alternate or the upper or all opposite, entire or toothed or rarely lobed; stipules present or absent, in foreign succulent species often transformed into spines (or prickles) above a pair of larger spines; in our native species the two stipules of each interpetiolar space fused into a single body. Flowers aggregated in capitula (cyathia), these resembling small hermaphrodite (or in some foreign species male) flowers; a single capitulum consisting of a number of stamens (really male flowers, each consisting of a single stamen jointed to a pedicel—staminophore—and soon falling away from it, without or rarely with a minute perianth just above the articulation) mingled with membranaceous scales or bracteoles, with (or in some foreign species without) a stipitate ovary (really a pedicellate female flower, with or without a minute 3-lobed or very rarely cup-like or tubular perianth at the base of the ovary, but without a membranaceous tubular involucel surrounding the pedicel) in their midst, contained in a calyx-like cup-shaped involucre. Involucre consisting of an outer series of 1–8 (usually 5) glands; these distinct and equally spaced or rarely united, entire or 2-horned or divided or appendaged at margin with a sometimes petaloid extension, alternating with an inner series of 4–8 (usually 5) membranaceous erect or inflexed fringe-toothed lobes. Anthers 2-celled; cells usually subglobose and more or less diverging, longitudinally dehiscent. Ovary partly or wholly included or (in our species commonly) exserted, 3- (rarely and then only for some foreign species 2-) celled, containing in each cell (coccus) a

single ovule (this pendulous from the apex of the cell's inner angle); styles 3 or rarely 2, free or more or less united below, entire or more or less deeply bifid at apex. Fruit a 3- (rarely 2-) celled capsule; cells separating at maturity from the central persistent axis and opening along their inner face into 2 valves, liberating the seed; inner part of valves hard or cartilaginous. Seeds with a thin crustaceous testa, smooth or variously sculptured, our native species lacking but many other species having a caruncle; embryo straight, with flat cotyledons, enclosed in a thick albumen. (Description of genus based in considerable part upon that by the late Dr. N. E. Brown *in* Thiselton-Dyer, Flora of Tropical Africa **6**: sect. 1: 470. 1911.)

KEY

a. Fruticose or arborescent; leaves all opposite and distichous; stipules on each side fused into a single more or less triangular or crescentic interpetiolar body; involucral glands entire; seeds ecarunculate; native species.
  b. Inflorescence commonly several times branched and becoming 1.5–6 (or even 7.5) cm. long, open, heads usually 5–20.
    c. Capsules 1.3–2.2 cm. long, bright pink to dark crimson or scarlet; pedicels thickish; native of northeastern Oahu.....*3. E. Rockii*
    c. Capsules smaller, pedicels capillary or nearly so.
      d. Leaves scarcely petiolate, petioles 1–3 mm. long; plants of Oahu.
        e. Veins of leaves obscure on upper surface; blade commonly 4–9 cm. long and 2–3.4 cm. wide.....*1. E. Clusiaefolia*
        e. Veins of leaves manifest on upper surface; blade commonly 7–16.5 cm. long and 2.5–4.5 cm. wide.....*2. E. Forbesii*
      d. Leaves definitely petiolate, the slender petioles 5–18 mm. long; native of Kauai.....*4. E. Remyi* var. λ. *kauaiensis*
  b. Inflorescence monocephalous, or if polycephalous at least more contracted, usually less than 1.5 cm. long.
    c. Capitula usually 3–11 in each cyme.
      d. Capitular clusters (that is, cymes) dense and subglobose, 4–8 mm. long; blades of principal leaves obtuse at apex, narrowed at base, 2–3.3 cm. wide; native of Kauai.....*5. E. halemanui*
      d. Capitular clusters mostly longer than broad, or flattened but hardly dense or subglobose.
        e. Leaf-blades oblong-elliptic, at apex mostly subacute to acute; inflorescence 0.5–1.5 cm. long.....*11. E. Hillebrandii* var. *β. palikeana*
        e. Leaf-blades more or less oblanceolate, at apex rounded to obtuse or truncate-emarginate.
          f. Cymes open, the branches slender, capitula pedicelled.
            g. Leaves noticeably divaricate (except for terminal 1 or 2 pairs, which are antrorse) and distichous, more or less falcate, often 5–7 cm. long.....*6. E. Celastroides* var. *ν. lorifolia*

g. Leaves directed variously, not or scarcely falcate, seldom more than 5 cm. long.
h. Capitula in poly(±11)-cephalous cymes.....
.....*6. E. Celastroides* var. *o. niuensis*
h. Capitula solitary in the axils or clustered in 2–5-cephalous cymes.....*6. E. Celastroides* var. *ξ. hanapepensis*
f. Cymes more contracted, capitula sessile to subsessile.
g. Branchlets thick, conspicuously woody, very nodose; native of northwesternmost Oahu.....*6. E. Celastroides* var. *δ. kaenana*
g. Branchlets delicate, appearing as if subherbaceous, nodes small and farther apart; natives of Kauai.....
.....*8. E. atrococca* and varieties *β. kokeeana* and *γ. kilaueana*
c. Capitula commonly 1–3 to a leaf axil.
d. Principal leaves with mostly orbicular-cordate blades, these commonly 1–2 cm. long.....*14. E. Degeneri* and var. *β. molokaiensis*
d. Principal leaves with ovate-oblong to linear blades.
e. Leaf-blades repand-denticulate.....*12. E. Hookeri*
e. Leaf-blades entire or obsoletely denticulate.
f. Stipular body leaving soon a basal whitish callosity; natives of Kauai and at least formerly of Oahu.....*4. E. Remyi* and vars.
f. Stipular body usually persistent, basal callosity absent or inconspicuous.
g. Leaves apically more or less acute.
h. Leaf-blades ovate; native of western Maui and perhaps also of Lanai.....*12. E. Hookeri* var. *β. integrifolia*
h. Leaf-blades narrower.
i. Leaf-blades narrowly or sometimes broadly oblong-elliptic; natives commonly of Oahu or very rarely of northwesternmost Maui....*11. E. Hillebrandii* and var. *γ. waimanoana*
i. Leaf-blades linear-oblong or oblong-linear; natives of Hawaii and West Maui..*7. E. olowaluana* and var. *β. gracilis*
g. Leaves apically more or less obtuse or rounded to truncate-emarginate.
h. Leaf-blades mostly oval to obovate, commonly 1.5–3.5 cm. wide.....See under first "a" in key for *6. E. Celastroides*
h. Leaf-blades suborbicular to linear (or even more or less obovate but) commonly less than 1.5 cm. wide (or if a few cauline leaves wider, then rameal leaves very numerous and branchlets prominently ridged and often with additional diminutive bracting leaves).
i. Involucral pedicels capillary, somewhat flexuous, becoming 1.5–1.8 cm. long.....*6. E. Celastroides* var. *μ. nematopoda*
i. Involucral pedicels (if present) stouter or shorter or both.
j. Capitula usually many to a branchlet, each node of which may bear a short slender flowering axis in one axil.
k. Capitula sessile to subsessile.
l. Leaf-blades mostly less than 2 cm. long; petiole tomentose.

m. Leaves silvery-tomentulose beneath.....
.....*9. E. multiformis* var. *θ. kaalana*
m. Leaves glabrous on both surfaces.....
.....*9. E. multiformis* var. *ι. perdita*
l. Leaf-blades mostly 3–4.5 cm. long; petiole glabrous
.....*6. E. Celastroides* var. *δ. kaenana*
k. Capitula pedicellate.
l. Capitular pedicels (on well developed specimens) ±13 mm. long....*6. E. Celastroides* var. *λ. Humbertii*
l. Capitular pedicels 3–8 mm. long.
m. Leaves noticeably divaricate (except for terminal 1 or 2 pairs, which are antrorse) and distichous, more or less falcate, often 5–7 cm. long.....*6. E. Celastroides* var. *ν. lorifolia*
m. Leaves directed variously, not or scarcely falcate, seldom more than 5 cm. long.....
.....*6. E. Celastroides* var. *ξ. hanapepensis*
j. Capitula few to a branchlet.
k. Capitula sessile or subsessile (pedicel less than 2 mm. long).
l. Mature seeds mostly tetragonal, 1.7–2 mm. long.
m. Leaves mostly broad-obovate to almost rotund.
n. Leaves densely crowded, ultimate branches (unless in form *kahanana)* mostly short and thick like penultimate ones, involucres usually sessile, capsules glabrous or nearly so; native of easternmost Molokai and (f. *kahanana)* eastern Oahu.....
.....*6. E. Celastroides* var. *ι. halawana*
n. Leaves few or many but ultimate branches mostly slender to even capilliform and thus unlike penultimate ones, involucres usually subsessile or short-pedicellate.
o. Capsules appressedly and more or less arachnosely whitish-hispid, finally glabrate at some places; native of northwestern Hawaii..*6. E. Celastroides* var. *κ. saxicola*
o. Capsules glabrous (or perhaps hispid for *13. E. festiva* and *9. E. multiformis* var. *η. tomentella,* natives of Oahu).
p. Young branchlets pubescent.
q. Branchlets, involucres, and pedicels tomentulose .....
.....*9. E. multiformis* var. *η. tomentella*
q. Branchlets spreading-hispidulous.
r. Leaf-blades commonly cuneate-obovate; involucral glands somewhat

spreading; native of East Maui....
...*9. E. multiformis* var. γ. *haleakalana*
r. Leaf-blades more often broad-oval to linear-elliptic; involucral glands appressed; natives of southwestern Oahu and northwesternmost Molokai
.....*10. E. Skottsbergii* and vars. β. *kalaeloana* and γ. *audens*
p. Young branchlets glabrous or essentially so.
q. Dwarf shrub up to 6 dm. tall; capitula few, solitary in upper axils; bog plant of southern Kauai.....
.....*9. E. multiformis* var. ζ. *sparsiflora*
q. Shrub or tree, capitula few or numerous.
r. Leaf-blades oblong or more rarely ovate-oblong, at base broadly subcordate or even moderately cordate, on each margin commonly very obsoletely 1–8-denticulate..*13. E. festiva*
r. Leaf-blades variously narrow-oblong to obovate, at base more or less cuneately narrowed, at margins entire
9. E. multiformis and var. β. *microphylla*
m. Leaves mostly oblanceolate or narrower.
n. Ultimate branchlets capilliform or nearly so
.....*9. E. multiformis* var. δ. *kapuleiensis*
n. Ultimate branchlets mostly coarser.
o. Ultimate branchlets slender, often subherbaceous, their internodes rather elongate.
p. Leaves entire.....
.....*9. E. multiformis* var. ε. *manoana*
p. Leaves commonly 3–10-denticulate on each edge..*10. E. Skottsbergii* var. δ. *Vaccinioides*
o. Ultimate branchlets thickish, ligneous, their internodes short.....
.....*6. E. Celastroides* var. π. *amplectens*
l. Mature seeds mostly biconvex, 1-4–1.6 mm. long
.....*6. E. Celastroides* var. ρ. *mauiensis*
k. Capitula all or many definitely slender-pedicellate (pedicel 4–7 mm. long).....
.....*6. E. Celastroides* var. ζ. *haupuana*
a. Herbaceous, annual or perennial; introduced species.
b. Involucral glands with petaloid (not corniculate) appendages.
c. Capsule glabrous.....*16. E. Hypericifolia*
c. Capsule pubescent.
d. Capitula in peduncled clusters.....*15. E. hirta*

d. Capitula in axils of leaves or leaf-like bracts.
e. Capsule whitish-ciliate along and sometimes near its angles; stipules on upper side of stem usually distinct linear and pilose, those on lower side united into one deltoid or deltoid-ovate body, this apically laciniate-toothed.....*18. E. prostrata*
e. Capsule apressed-hirtous; stipules all elongately lanceolate-subulate, hairy-fimbriate.....*17. E. Thymifolia*
b. Involucral glands with corniculate appendages or none.
c. Involucral glands exappendiculate.
d. Floral leaves white or pale-pink at base; seeds carinate on outer face.....*20. E. geniculata*
d. Floral leaves commonly red to purplish at base; seeds ecarinate.....*19. E. heterophylla* and var. *β. cyathophora*
c. Involucral glands with corniculate appendages.....*21. E. Peplus*

Section 1. ANISOPHYLLUM (Haworth) Röper

Sect. 1. ANISOPHYLLUM (Haworth) Röper *in* J. E. Duby, Bot. Gall., p. 412. 1828; genus *Anisophyllum* Haworth, Synops. Plant. Succulent., p. 159. 1812.

Herbs, shrubs, or trees, common in temperate and even more so in tropical regions of the whole world. Leaves opposite in our species, at base more or less oblique. Leaf petioles each with a pair of stipules at base, each stipule fused with the nearer stipule of the opposite pair into a single interpetiolar body. Capitular involucres minute in our species, solitary or cymose; their glands not or rarely (nos. 14 and 15) appendiculate. Bracteoles among the staminate flowers of many-flowered capitula plumose, of few-flowered capitula setaceous or obsolete. Glands 4 or 5 in our species. Seeds without caruncle.—Nos. 1–18.

1. Euphorbia Clusiaefolia Hooker & Arnott, Bot. Beechey's Voy., p. 95. 1832; Boissier, Icon. Euphorb., *tab. 1.* 1866.

Anisophyllum nodosum Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 22. 1860.

Chamaesyce Clusiaefolia (Hook. & Arn.) Arthur, Torreya **22**: 30. 1922.

Shrub, suberect and up to 2 m. tall or subprocumbent, branches not rigid. Leaves opposite, petiole about 2–4 mm. long; blade obovate- or elliptic-oblong, commonly 4–9 cm. long

and 2–3.4 cm. wide, at apex obtuse or rounded and often emarginate, at base narrowed and often oblique, at margins revolute, subcoriaceous, very glabrous, veins obscure (lateral ones divaricate); stipules coalesced two into one, this interpetiolar, obtusely triangular, 2–3 mm. tall. Cymes at ends of branches and in uppermost axils, 1.5–3 (more rarely –4.3) cm. long, once or again di- or trichotomous, mostly 3–6-headed. Involucre campanulate to hemispherical, outwardly glabrous to slightly glandular or pubescent, about 2 mm. tall; pedicel slender, stiff, glabrate to sparsely and irregularly pubescent, 6–14 mm. long; the widely stalked glands transversely oblong and reniform, purplish-black when dried, exappendiculate; lobes 4 or 5, short-obovate to ovate-rounded, denticulate; stamens numerous, their bractlets split into linear lobes and fimbriate. Capsule cernuous, glabrous, 6–9 mm. long, the cocci usually somewhat convex on each side of the subobtuse keel; stipe slender, pubescent, 3–5 mm. long. Seeds oblong-cylindric, obscurely 4- or 5-sided, obtuse at both ends, pinkish-white to reddish-brown, glabrous but more or less lengthwise-wrinkled, about 3 mm. long.

Type: Collected by *Lay and Collie* on Captain Beechey's Voyage, Oahu, 1826–27 (Kew).

Distribution: Oahu.

Specimens examined: *Donald Anderson,* open woods, alt. 1200–1300 ft., wet ridge, Kalihi Ridge, Koolau Mountains, Oahu, January 12, 1932 (Bishop); *anon.,* Nuuanu, Oahu (Bishop); *H. F. Bergman,* Konahuanui-Olympus Trail, Oahu, February 25, 1928 (Field); *E. Christophersen & E. Hume 1411,* alt. 500–750 m., Kahuauli ridge, Oahu, December 17, 1930 (Delessert; Field, 2 sheets; Kew); *Otto Degener 8064,* dryish exposed shrubby slope, east rim of Nuuanu Valley leading to summit of Konahuanui, Oahu, February 25, 1928 (Degener, 3 sheets; Field; New York); *Degener & Eichi Masunaga 8095,* moderately dry exposed ridge, above Pauoa Flats on way to summit of Konahuanui, Oahu, April 2, 1926 (Degener, 3 sheets; Field); *Degener, Park, Potter, Bush & Topping 9964,* in open rain-forest near summit, Waimano, Oahu, June 9, 1935 (Degener; Field; Paris); *Degener, Park, Potter, Bush & Topping 9968,* forested rainy ridge, Middle Halawa Ridge, Oahu, May 26, 1935 (Berlin; British; Cornell; Degener; Delessert; Field; Florence; Gray; Kew; Leningrad; Missouri; New York; Paris; Philadelphia; Pomona; Stanford; U. S.; Vienna); *Degener, Park, Potter, Bush & Topping 10029,* near summit, Poamoho Trail, Laie, Oahu, Aug. 18, 1935 (British; Degener; Delessert; Field); *Otto Degener, D. LeRoy Topping & Colin Potter 10075,* middle Halawa, Oahu, November 10, 1935 (Berlin; British; Degener; Delessert; Field; Gray; Kew; Paris; Vienna); *Abbé Urbain Faurie 479,* Kalihi, Oahu, October, 1909

(Bishop; Delessert; Paris); *Charles N. Forbes,* Waiolani Ridge, Lanihuli Trail, Oahu, 1908 (Bishop); *Forbes,* Waiolani, west side of Nuuanu Valley, Oahu, June 28, 1908 (Missouri); *Forbes,* Waiolani, west side of Nuuanu, and Honolulu, Oahu, same date (Field); *Forbes,* Waiolani, July 8, 1908 (Field, 2 sheets; Missouri); *Forbes,* Koolauloa Mts., west of Punaluu Valley, Oahu, May 8–13, 1909 (Field); *Forbes 2550-O,* Konahuanui ridges, Oahu, March 17, 1919 (Berlin; Field); *Forbes & John F. G. Stokes,* Lanihuli Trail, Oahu, June 28, 1908 (Field); *D. Wesley Garber 241,* Konahuanui-Olympus Trail, Oahu, February 15, 1920 (Bishop); *Charles Gaudichaud,* Hawaiian Isls. (Berlin; Gray); *Gaudichaud 283,* same place, September–October, 1836 (Field; Paris); *Amos Arthur Heller 2345,* on lower slopes of Konahuanui, above Manoa, Oahu, May 13, 1895 (Field, 3 sheets); *Heller* (similarly) *2345,* same locality, May 23, 1895 (Cornell; Field; Gray; Kew; Missouri; New York; Paris; U. S.); *Dr. William Hillebrand,* Hawaiian Isls. (U. S.); *Hillebrand,* Nuuanu, Oahu (Kew); *Hillebrand 46,* shrub, alt. 2000–3000 ft., left of Nuuanu, Oahu, May, 1861 (Berlin; Kew; Vienna); *Hillebrand & Rev. John M. Lydgate,* Oahu (Bishop); *A. F. Judd 27,* shrub, vicinity of Kalihi, Oahu, Nov. 4, 1925 (Bishop); *Lay & Collie* (Captain Beechey's Voyage), Oahu (type, Kew); *Horace Mann & William T. Brigham,* Oahu, 1864–1865 (Cornell); *Kazuto Nitta* (Otto Degener's distrib. no.) *8181,* alt. 800 ft., Kipapa, Oahu, November 10, 1929 (Degener); *Joseph F. Rock,* Palolo, Oahu (Field); *Rock,* Konahuanui, Oahu, September, 1912 (Berlin; Field; Kew); *Rock 967,* same locality, January 7, 1909 (Berlin; Delessert; Field, 2 sheets; Kew; Vienna); *Rock 1011,* same locality and date (Gray); *Rock 3037,* Kaukonahua, Wahiawa, Oahu, May 15, 1909 (Delessert); *Topping 3066,* Wahiawa-Waikane, Oahu, March 8, 1925 (N. Y.); *Topping 3276,* Konahuanui, Oahu, February 7, 1926 (Degener); *U. S. Explor. Exped.,* Pearl River and mountains behind Honolulu, Oahu, 1840 (Missouri); *Dr. Heinrich Wawra 1647,* Oahu, 1868–1871 (Vienna, 3 sheets).

Another specimen by Forbes (Koolauloa Mountains, between Punaluu and Kaipapau, Oahu, December 14–21, 1908—Bishop) appears to be a hybrid between *E. Clusiaefolia* and *E. Hillebrandii.*

2. Euphorbia Forbesii Sherff, Bot. Gaz. **97**: 582. 1936.
Chamaesyce Forbesii (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Glabrous, probably a more or less erect shrub; stem's internodes more often 1.5–3.5 cm. long, brownish-red when dry. Leaves opposite, not numerous, petiole only about 1–3 mm. long; blade oblongly elliptic or oblanceolate, at apex obtuse and often slightly emarginate, at base oblique (and on one side often subcordate), thickish or membranous, slightly revolute, paler beneath, penninervate (lateral nerves numerous, obscure, divaricate), becoming (for the principal leaves) 10–16.5

cm. long and 2.5–4 cm. wide; stipular body widely triangular, narrowed above, about 2 mm. tall. Cymes of inflorescence axillary and terminal, open, more or less decompound (the branches and branchlets not strongly spreading), up to 7.5 cm. long, 8–15-cephalous. Involucre hemispherical, outwardly more or less pubescent, 1.5–3.5 mm. tall; glands 4 or more often 5, very broadly stipitate, transversely oblong (conspicuously reniform), exappendiculate, purplish-black when dry; lobes ovate, hispid; pedicel slender, angulate, sulcate, glabrate or more often minutely spreading-hispidulous, more often 1–2.2 cm. long. Capsule angulate-cylindric, at each end truncate, glabrous, about 6 mm. tall, cernuous, the glabrate stipe about 3–4 mm. long; styles distinct, their branches not conspicuously separated; seeds subtetragonally plano-convex, dorsally carinate, basally truncate, apically obtuse, scrobiculate, pinkish-gray, about 2.8 mm. long.

Type: Collected by *Charles Noyes Forbes*, no. *2218-O*, Wahiawa ditch trail, Oahu, August 17–20, 1915 (Field).

Distribution: Oahu.

Specimens examined: *Degener 8083*, in forest, mountains back of Wahiawa, Oahu, November 25, 1926 (Degener; Field; N. Y.); *Forbes 1623-O*, Wahiawa, Oahu, December 18, 1910 (Field); *Forbes 1770-O pro parte*, Mokuleia, slopes of Puu Kaala, Oahu, April 26–May 16, 1912 (Bishop; Field); *Forbes 2218-O* (type, Field: cotypes, Field; Kew; Missouri); *Edward Y. Hosaka 340*, alt. 1600 ft., South Opaeula Gulch, Paalaa, Koolau Mountains, Oahu, November 9, 1930 (Bishop); *Rock 3037*, Kaukonahua, Wahiawa, Oahu, May 15, 1909 (Field; Gray; New York); *Harold St. John 10629*, shrubs 8 ft. tall, alt. 1800 ft., shady woods on ridge, South Opaeula Gulch, Paalaa, Koolau Mountains, Oahu, November 9, 1930 (Berlin; Delessert; Field; Kew).

Euphorbia Clusiaefolia var. *grandifolia* Hillebr. (Fl. Haw. Isls., p. 395. 1888) was described by Hillebrand evidently from the lone sterile branch preserved in his herbarium (Berlin; the specimen is now before me). This branch came from "Makaleha in the Kaala range" and doubtless belongs either to *E. Forbesii* or to *E. Rockii*.

3. Euphorbia Rockii Forbes, Bishop Mus. Occas. Paps. **4**: 214, and *plate*. 1909; Rock, Indig. Trees Haw. Isls., p. 261, *pl. 101*. 1913.

Chamaesyce Rockii (Forbes) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Erect shrub or small tree, glabrous, 1–4 m. tall. Leaves opposite, quite or almost sessile, elliptic-oblong to narrowly obovate-oblong, oblique, clasping at the rounded to cordate base, apically subobtuse, marginally revolute, subcoriaceous, pale underneath, 8–13 cm. long and 2–3 cm. wide; stipular body triangular, subacuminate above, about 2.5 mm. tall. Inflorescence of open, ±13-cephalous cymes at ends of branches and in uppermost axils, 2–6 cm. long. Involucre campanulate, outwardly glabrous or minutely pubescent, internally pubescent, barely 2 mm. tall; pedicel slender, hispidulous, 2–5 mm. long; glands transversely oblong, exappendiculate; lobes minute, ovate, hispid. Styles connate near base, shortly bilobed. Capsules ovoid to obovoid, trigonal (the cocci convex on both sides of their sharply lineate keel), glabrous, bright pink to dark crimson or scarlet, 1.3–2.2 cm. long, the stipe about 4–5.5 mm. long. Seeds globose-cylindric, blackish-brown, glabrous but lengthwise somewhat costate, 3–3.5 mm. long and about 2.6 mm. thick.

Type: Collected by *Charles Noyes Forbes and Joseph F. Rock,* Punaluu Mountains, Oahu, November 14–21, 1908 (Bishop).

Distribution: Northeastern Oahu.

Specimens examined: *Otto Degener, W. Hirai & Kwan Kee Park 8039,* windswept summit, Waikane-Schofield Trail, Oahu, April 4, 1931 (Degener; New York); *Degener, Park & Manuel Kwon 8051,* at summit of Pig God Trail, along rivulet just west of trail in exposed rain forest, overlooking Punaluu Valley, Oahu, January 17, 1932 (Degener, 3 sheets; Field); *Degener, Park, Bush, Potter & Topping 9965,* in rain-forest at summit, Pig God Trail, Punaluu, July 4, 1935 (Berlin; British; Degener; Field; Kew; Paris; Vienna); *Abbé Urbain Faurie 480,* alt. 800 m., Punaluu, Oahu, May, 1910 (British; Paris); *Forbes,* Punaluu Mountains, Oahu, November (not September) 14–21, 1908 (Missouri); *Forbes,* Punaluu Mountains, between Punaluu and Kaipapau, Oahu, same date (Field); *Forbes & Rock,* Punaluu Mts., November 14–21, 1908 (cotype, Field); *Forbes & Thompson,* same locality, May 8–13, 1909 (Berlin; Delessert; Field; Kew); *Edward Y. Hosaka 313,* alt. 2000 ft., Punaluu, Koolau Mountains, Oahu, September 28, 1930 (Bishop); *Raymond Inafuku,* wet ridge, alt. 2700 ft., same locality and date (Bishop); *A. F. Judd,* alt. 2000 ft., in woods, Kaluanui, Punaluu, Oahu, November 19, 1933 (Bishop); *N. H. Krauss,* alt. 1250–2400 ft., Kahana, Waikane-Schofield Trail, Oahu, October 16, 1932 (New York); *S. Nakagawa,* wet woods, Punaluu, half-way to top of Koolau Mountains, Oahu, September 28, 1930 (Bishop); *Rock,* Punaluu

Mountains, Oahu, August, 1908 (Gray; New York); *Rock*, same locality, November, 1914 (Berlin; Delessert; Field; Kew; Paris); *Rock 112*, same locality, November 14–21, 1908 (Berlin; Delessert; Kew; Vienna; really type material); *Rock 412*, shrub with dark crimson capsules, summit ridge of Punaluu, Oahu, December 3–14, 1908 (Bishop); *Rock 697*, Punaluu, Koolau Mountains, December 3, 1908 (Gray); *Dr. Carl Skottsberg 384*, Makaleha Valley, Waianae, Oahu, August 30, 1922 (Bishop); *Skottsberg 1846*, ridges above Kahana Bay, Oahu, September 17, 1926 (Bishop); *Harold St. John 10097*, scarlet fruit, tree 20 ft. tall, alt. 2000 ft., tall wooded stream bank, Kaluanui, Oahu, November 30, 1929 (Berlin; British; Field; Paris); *St. John 10578*, alt. 2300 ft., thicket on crest of ridge, Punaluu, September 28, 1930 (Bishop); *Topping 3271*, Wahiawa-Waikane Trail, Oahu, December 27, 1925 (Degener; New York).

4. Euphorbia Remyi A. Gray *ex* Boissier *in* DC., Prodr. **15**, pt. 2: 1262. 1862.

Euphorbia Remyi var. α. A. Gray *ex* Boiss., loc. cit.

Euphorbia Remyi A. Gray *ex* H. Mann, Proc. Amer. Acad. **7**: 201 (Enum. Haw. Pl., no. 438). 1867 (as to plant, *Remy 598*, from Oahu).

Chamaesyce Remyi (A. Gray) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Inflorescence open, branched, 3–7-cephalous.
  b. Involucres about 3 mm. across the top, capsules with broad lengthwise bands of dense tomentum; plant of northern Kauai....var. μ. *hanaleiensis*
  b. Involucres about 4 mm. across at top, capsules essentially glabrous; plant of southern Kauai.....var. λ. *kauaiensis*
a. Inflorescence of 1 or even 2 or 3 unbranched monocephalous peduncles.
  b. Petioles mostly 1–2 cm. long, slender, blades obtuse at apex..var. ε. *leptopoda*
  b. Petioles mostly less than 1 cm. long, or if longer then robust and margined or with blades subacuminate at apex.
    c. Leaf-blades mostly 4–8.5 cm. long.
      d. Leaf-blades acute or obtuse at apex.
        e. Leaf-blades membranaceous.
          f. Capsules 4 mm. tall.....var. ι. *olokelensis*
          f. Capsules ±2.2 mm. tall.....var. κ. *Wilkesii*
        e. Leaf-blades more or less coriaceous.
          f. Leaf-blades more often obovate-oblong or oblanceolate-oblong, at base more often somewhat narrow and oblique.
            g. Principal leaves 4–5 cm. wide.....var. β. *waimeana*
            g. Principal leaves 1.5–2.5 cm. wide.....var. θ. *molesta*
          f. Leaf-blades not or only a few obovate, at base mostly rounded and equilateral, those of principal leaves 2–3 (more rarely –3.8) cm. wide.....*E. Remyi*
      d. Leaf-blades moderately acuminate at apex.....var. ζ. *kahiliana*

c. Leaf-blades longer.
d. Leaf petioles and midribs narrow.
e. Leaves blunt or rounded at apex.
f. Leaf-blades 6–10 cm. long and 2–4.7 cm. wide.....var. *ι. olokelensis*
f. Leaf-blades 11–15.5 cm. long and 5–7 cm. wide.....var. *δ. Lydgatei*
e. Leaves subacute to subacuminate at apex.
f. Leaf-blades 7–14 cm. long and 3–5 cm. wide.....var. *η. wahiawana*
f. Leaf-blades 6–9 cm. long and 1.5–2.6 cm. wide.....var. *κ. Wilkesii*
d. Leaf petioles and midribs broad, margined.....var. *γ. pteropoda*

Glabrous, probably an ascending or suberect shrub 1–2 m. tall; internodes of stem 0.5–2 cm. long, of slender lateral branches much shorter. Leaves slenderly petiolate with petiole about 3–8 mm. long; blade variously oblong, oblong-elliptic oval or seldom subrhombic-oblong, at obtuse apex somewhat pointed (not emarginate), at base mostly rounded and equilateral, very entire and irregularly revolute, subcoriaceous, subglossy, delicately and numerously penninerved with divaricate nerves, 5–6.5 (a few blades up to 8.5) cm. long and 2–3 (a few up to 3.8) cm. wide; stipular body triangular, about 1–1.5 mm. tall, leaving a basal finally whitish callosity. Peduncles slender, glabrate, 5–10 mm. long, monocephalous, axillary and terminal, solitary or 2 or 3 in a fascicle. Involucre campanulate, outwardly glabrous or glabrate, about 2.4 mm. tall; glands commonly 5, transversely ovate and more or less reniform, exappendiculate; lobes very minute, hirtous. Styles short, their branches short and thickish; capsule dark brown, cernuous on short (±1.5 mm.) glabrate stipe, glabrous, about 3 mm. tall, cocci carinate; seed (apparently submature) stramineous in color, tetragonal, carinate, about 2.1 mm. long, the faces conspicuously scrobiculate.

Type: Collected by *Jules Remy*, no. *598*, Oahu, 1851–1855 (Gray).

Distribution: Known only from Oahu, where apparently not collected since Remy's day.

Specimens examined: *Remy 598* (type, Gray: cotype, Paris).

Confusion has arisen in literature due to Horace Mann's publishing in 1867 *(loc. cit.)* what purported to be an original description of *Euphorbia Remyi* A. Gray, with Kauai cited

first (that is, before Oahu) for the habitat. We must note, however, that some five years previously Boissier *(loc. cit.)* had published *E. Remyi* A. Gray and cited Oahu first. In fact, Boissier listed two varieties, α. and β., and based variety α. directly upon *Remy 598* from Oahu. (For the var. β. see var. κ. *Wilkesii.)*

I have found no other specimens matching the Remy type and cotype (both now before me), and it may well be that the species proper is one of those probably numerous endemic Hawaiian species which have been exterminated within the past century. There are, however, various specimens from Kauai that fall into eleven more or less easily distinguishable varieties of *E. Remyi,* and these are treated below.

Euphorbia Remyi var. β. **waimeana** Sherff, Bot. Gaz. **97.** 584. 1936.

Leaves moderately more coriaceous and revolute, more often obovate-oblong, at base more often oblique and somewhat narrowed, blade commonly about 7–8.5 cm. long and 4–5 cm. wide. A single capitulum without fruit seen.

Type: Collected by *Charles N. Forbes,* no. *1043-K,* Kalalau Pali, Waimea Drainage Basin, west side, Kauai, July 3–August 18, 1917 (Field).

Distribution: Western Kauai.

Specimens examined: *Forbes 1043-K* (type, Field: cotypes, Berlin; Delessert; Field; Kew).

This may be the first of the two forms described by Hillebrand (Fl. Haw. Isls., p. 395. 1888) as having been collected by Knudsen in Waimea. Hillebrand described the stipules as low, triangular, and 1–1.5 lines long. This holds for the very few stipules still observable toward tips of branches on my type, but the stipules lower down are represented merely by the whitish interpetiolar callosities which are conspicuous in this species.

Euphorbia Remyi var. γ. **pteropoda** Sherff, Bot. Gaz. **97:** 585. 1936.

Leaves coarsely petiolate, the broad petiole margined and 6–

12 mm. long; blade widely elliptic-oblong, at times minutely emarginate, moderately revolute, subcoriaceous, 8–11 cm. long and 4–4.8 cm. wide.

Type: Collected by *Abbé Urbain Faurie,* no. *478,* alt. 800 m., Kauhao, Kauai, February, 1910 (Delessert).

Distribution: Northwesternmost Kauai.

Specimens examined: *Faurie 478* (type, Delessert: cotypes, Bishop; Paris).

A variety quite distinct from the species proper and the other varieties in its robust margined leaf petioles and wide leaf midribs. Only in var. *olokelensis* do the leaf petioles or midribs tend at all to simulate those of var. *pteropoda* and then only occasionally and only to a slight extent.

Euphorbia Remyi var. δ. **Lydgatei** Sherff, Bot. Gaz. **97**: 585. 1936.

Leaves slenderly petiolate, petiole 7–10 mm. long; blade oblong-obovate, at apex itself abruptly subacute, at base narrowed and oblique, weakly or scarcely revolute, membranaceous, 11–15.5 cm. long and 5–7 cm. wide, the veins evident.

Type: Collected by *Reverend J. M. Lydgate,* Pole Line Trail, Wailua Mountains, Kauai (Bishop).

Distribution: Eastern Kauai.

Specimens examined: *Lydgate,* Pole Line Trail, Wailua Mts., Kauai (type, Bishop).

Euphorbia Remyi var. ε. **leptopoda** Sherff, Bot. Gaz. **97**: 585. 1936.

Leaves slenderly petiolate, petiole obsoletely hispid and 8–22 mm. long; blade more often elliptic-oblong (rarely ovate-oblong or subrhomboidal-oblong), at apex obtuse and sometimes minutely emarginate, at base rounded or subcordate and more often oblique, not or very narrowly revolute, glossy, more often 9–13 cm. long and 3–4.5 (–5.3) cm. wide.

Type: Collected by *Charles N. Forbes,* no. *1095-K,* Halemanu, Kauai, July 3–August 18, 1917 (Bishop).

Distribution: Central to northwestern Kauai.

Specimens examined: *Otto Degener 8085,* Olokele Canyon, Kauai, July 3, 1926 (Degener, 2 sheets; Field); *Forbes 1095-K* (type, Bishop).

Euphorbia Remyi var. ζ. **kahiliana** Sherff, Bot. Gaz. **97**: 586. 1936 (where misprinted *kalihiana)*.

Leaves slenderly petiolate, petiole 3–6 mm. long; blade subrhomboidal-oblong, at apex commonly somewhat acuminate, at base often oblique and cuneate-rounded, membranaceous, lightly revolute, only 4–7 (more rarely –8.5) cm. long and 2–3.5 cm. wide, the veins obscure above.

Type: Collected by *Charles N. Forbes,* no. *10-K,* foot of Kahili, Kauai, July 8, 1909 (Field, 3 sheets).

Distribution: Southern Kauai.

Specimens examined: *Forbes 10-K* (type, Field, 3 sheets).

Euphorbia Remyi var. η. **wahiawana** Sherff, Bot. Gaz. **97**: 586. 1936.

Leaves slenderly petiolate, petiole 5–15 mm. long; blade now narrowly now widely oblong-obovate, often gradually narrowed to a more or less oblique base, at apex subacuminate, membranaceous, lightly revolute, 7–14 cm. long and 3–5 cm. wide.

Type: Collected by *Charles Noyes Forbes,* no. *177-K,* Wahiawa Mountains, Kauai, August, 1909 (Field).

Distribution: Known only from type locality in Wahiawa Mountains, southern Kauai.

Specimens examined: *Forbes 177-K* (type and cotype, Field); *Rev. John M. Lydgate,* Wahiawa Mts., Kauai (Bishop).

Euphorbia Remyi var. θ. **molesta.** (Pl. 2.)

Varietas nova. Folia numerosa (ramorum internodiis saepius circ. 4–8 mm. longis), petiolo tenui et 4–9 mm. longo; lamina oblanceolata, sensim ad basim inaequilateralem angustata, apice obtusa subacutave, plerumque emarginata, anguste revoluta, subcoriacea, 4–7 (raro –9) cm. longa et 1.5–2.5 cm. lata.

Leaves numerous (internodes of branches more often about 4–8 mm. long), petiole slender and 4–9 mm. long; blade oblanceolate, gradually narrowed to an oblique base, at apex obtuse or subacute, commonly emarginate, narrowly revolute, subcoriaceous, 4–7 (rarely –9) cm. long and 1.5–2.5 cm. wide.

Type: Collected by *Charles Noyes Forbes,* no. *224-K,* Wahiawa Mountains, Kauai, August, 1909 (Field, 2 sheets).

Distribution: Southern Kauai.

Specimens examined: *Forbes 224-K* (Field, 2 type sheets).

Treated in the herbarium by Forbes as a variety of *Euphorbia atrococca* Heller. That species, however, has the inflorescence distributed along delicate lateral branchlets, as in *E. multiformis,* while in our plants they are distributed upon the main woody branches themselves, as in the various varieties of *E. Remyi.*—The varietal name was given in allusion to the somewhat *burdensome* situation arising from having still another variety added to *E. Remyi.*

Euphorbia Remyi var. ι. **olokelensis** Skottsberg & Sherff *ex* Skottsb., Meddel. Göteb. Bot. Trädg. **10**: 121. (Febr. 7,) 1936 (without description); *ex* Sherff, Bot. Gaz. **97**: 586. (Apr. 2,) 1936 (with description).

Leaves narrowly or somewhat widely petiolate, petiole 4–12 mm. long; blade elliptic-oblong or subobovate-oblong, at the often oblique base now cuneate-narrowed now subcordate, at apex obtuse, membranaceous, scarcely or not revolute, 6–10 cm. long and 2–4.7 cm. wide.

Type: Collected by *Dr. Carl Skottsberg,* no. *1050,* innermost part of Olokele Valley, Kauai, October 31, 1922 (Bishop).

Distribution: Central to northwestern Kauai.

Specimens examined: *Charles N. Forbes 456-K,* Olokele Valley, Kauai, September, 1909 (Field); *Albert S. Hitchcock 15220,* alt. 1400 ft., Olokele Gulch, Kauai, October 18, 1916 (U. S.); *Joseph F. Rock 2078,* Halemanu, Kauai, February 14–26, 1909 (Bishop; Gray); *Rock 12936,* Kaholuamanu, Kauai, October, 1916 (Bishop); *Rock 17108,* same locality and date (Bishop); *Skottsberg 1037,* Olokele Canyon, Waimea, Kauai, October 31, 1922 (Gothenburg; juvenile and scarcely typical material); *Skottsberg 1050* (type, Bishop); *Dr. Heinrich Wawra 2086,* Kauai, *1868–1871* (Vienna, 2 sheets).

Rock 17108, which, although coming from Kaholuamanu, is so close to the Olokele specimens that it is not varietally separable, has a mature capsule measuring 4 mm. long, the cocci obtuse on the back. The specimens from the type locality proper are without mature capsules.

Euphorbia Remyi var. κ. **Wilkesii** Sherff, Bot. Gaz. **97**: 587. 1936.

Euphorbia Remyi var. β. Boiss. *in* DC., Prodr. **15**, pt. 2: 1262. 1862.

Leaves narrowly oblong, at base obliquely narrowed, at the subacute or acute apex rarely somewhat subacuminate, very membranaceous, not revolute, the slender petiole about 7–11 mm. long, the blade 6–9 cm. long and 1.5–2.6 cm. wide. Involucre 2 mm. tall. Capsule only about 2.2 mm. tall, cocci acutely carinate and not sulcate; seeds tetraquetrous, their sides scrobiculate; stipe much reflexed.

Type: Collected by the *United States Exploring Expedition,* Kauai, 1840 (U.S.).

Distribution: Kauai, exact part unknown.

Specimens examined: *U. S. Explor. Exped.,* Kauai, 1840 (type, U. S.).

Asa Gray supplied a description of his *Euphorbia Remyi* to Boissier, as is shown in Boissier's citation "A. Gray in litt." and the additional note, "Descr. ex cl. A. Gray in litt." Boissier published the description in 1862. As already stated (see p. 17), Boissier listed two varieties, α. and β., basing α. on *Remy 598, "absque fructu,"* from Oahu, and β. on the material collected by the United States Exploring Expedition (that is, the "Wilkes Expedition"), on Kauai. Gray's description of the species *E. Remyi* included the fruit. But since *Remy 598* was *"absque fructu"* (and this is confirmed by an examination of Gray's ample type specimen now before me), the fruit clearly must have been described from that in the packet of fragmentary but fruiting *U. S. Explor. Exped.* material which Gray had before him and from which (as stated on the label) he sent "a little to Boissier."

Shortly after Boissier's work was published, Horace Mann and William T. Brigham botanized in the Hawaiian Islands (May 4, 1864–May 18, 1865). They collected a specimen with larger, more acuminate leaves and with capsules 4 (not about 2.2) mm. long, the cocci obtuse (not acutely keeled) upon their backs. Asa Gray saw this material; his fragment of it, labeled "*Euphorbia Remyi* n. sp." in his own handwriting, is still pre-

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served (Gray). He evidently at once revised his supposedly unpublished description of *E. Remyi* in an attempt to allow for the larger capsules, and Mann, in 1867 (Proc. Amer. Acad. **7**: 202; Enum. Haw. Pl., no. 438), published the description as revised. Thus we read: "Capsules small, acutely triangular-3-lobed, and glabrous (immature?), or much larger, 2 lines long, the cocci obtuse on the back." The two types of fruit and even of leaves are varietally incongruous, and I limit the variety *Wilkesii* to plants typified by the original Wilkes (small-fruited) material. (For further consideration of the *Mann & Brigham* plant, see variety μ. *hanaleiensis.)*

Euphorbia Remyi var. λ. **kauaiensis** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 584. 1936.

Leaf petiole slender, 5–18 mm. long; blade elliptic-oblong or more rarely -lanceolate or subrhomboid-oblong, at apex subacute and very rarely emarginate, at the more or less oblique base cuneate-narrowed or rarely subrounded, subglossy, membranaceous, 8–15.5 cm. long and 3–5 cm. wide, penninerved (the lateral nerves divaricate, slender, manifest), very entire, not or very minutely and irregularly revolute. Inflorescence axillary and terminal, irregularly branched (nodules stipuliferous, often 2-budded), 1.5–4 cm. long, commonly 3–7-cephalous. Involucre when dry blackish or purplish-black, hemispherical, outwardly glabrate or toward top hispidulous, 3 mm. tall; glands commonly 5, transversely oblong, exappendiculate; lobes small, hirtous; pedicel slender, blackish, glabrate or sparsely setose (often irregularly and very minutely more or less slender-papillate), more often 7–10 mm. long. Capsule cylindric-ovate, subacutely trigonal, glabrous, shortly stipitate (stipe apparently always straight or nearly so), 3.5–4 mm. tall; styles distinct to the base, the short or very short lobes thickened. Seeds chestnut-colored, acutely tetragonal, at base truncate, at apex obtuse, on faces scrobiculate, about 2–2.2 mm. long.

Type: Collected by *Otto Degener*, no. *8093*, near Hanapepe Falls, Kauai, June 19, 1926 (Field).

Distribution: Southern Kauai.

Specimens examined: *Degener 8093* (type, New York; cotypes, Degener, 2 sheets; Field).

Euphorbia Remyi var. μ. **hanaleiensis** Sherff, Bot. Gaz. **97**: 588. 1936.

Leaves membranaceous, the slender petiole ±8 mm. long; blade broadly oblanceolate-oblong, at apex subacuminate, ±12.5 cm. long. Inflorescence very delicate, ±1.7 cm. long, branched, ±4-cephalous, the slender pedicels glabrous and 4–7 mm. long; involucre ±3 mm. across, tomentulose above; cocci densely tomentulose toward margins, about 4 mm. long; seeds tetragonal, scrobiculate, about 3 mm. long.

Type: Collected by *Horace Mann* and *William T. Brigham*, Hanalei, Kauai, 1864–1865 (Cornell).

Distribution: Northernmost Kauai.

Specimens examined: *Mann & Brigham*, Hanalei, Kauai, 1864–1865 (type, Cornell: cotype fragment, Gray).

5. Euphorbia halemanui Sherff, Bot. Gaz. **97**: 582. 1936. (Pl. 3.)

Chamaesyce halemanui (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Glabrous, probably a shrub 1–2 m. tall, internodes of branches commonly 0.5–1.5 cm. long. Leaves opposite, petiole slender and 5–10 mm. long; blade elliptically or sometimes subrhomboidally oblong or obovate, at apex obtuse and not emarginate, at base narrowed but scarcely oblique, at margins not or scarcely subrevolute, pinnately nerved (nerves divaricate, on upper surface often obscure), 4.5–8 cm. long and 2–3.3 cm. wide; stipular body triangular, scarious, 1–2 mm. tall, its upper margin fimbriate. Inflorescences axillary and terminal, contracted, globose, only 4–8 mm. tall, each of about 4–10 capitula. Involucre urceolate, outwardly glabrous, under 2 mm. tall; glands 4 or 5, transversely oblong, exappendiculate; pedicel minute, glabrous, under 3 mm. long; staminophores numerous, exserted. Capsule (submature) cernuous, very glabrous, trigonous, 2.2 mm. tall; cocci subacutely carinate; stipe glabrous, up to 3 mm. long; styles very distinct to the base, their short branches thickened.

Type: Collected by *Charles N. Forbes*, no. *1095-(a)K*, Halemanu, Kauai, July 3–August 18, 1917 (Bishop).

Distribution: Northwestern Kauai.

Specimens examined: *Forbes 943-K*, Halemanu, Kauai, July 3–August 18, 1917 (Bishop); *Forbes 1095-(a)K* (type, Bishop); *Dr. Carl Skottsberg 1002*, forest near Kokee Ranger Station, Kauai, October 28, 1922 (Bishop).

Noticeable for its minute globose very much contracted clusters of heads, a cluster usually measuring 4–7 mm. tall.

6. Euphorbia Celastroides Boissier *in* DC. Prodr. **15**, pt. 2: 11. 1862; Christoph. & Caum, Bishop Mus. Bull. no. 81: 6, *pl. 2-B*. 1931.

Euphorbia multiformis var. *Celastroides* A. Gray *ex* H. Mann, Proc. Amer. Acad. **7**: 202 (Enum. Haw. Pl., no. 439, var. ε.). 1867.

Chamaesyce Celastroides (Boiss.) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Leaves mostly oval to obovate, commonly 1.5–3.5 cm. broad.
  b. Leaves mostly oval to subrhombic-oval; pedicel 1–3 mm. long.
    c. Leaves mostly subrhombic-oval, basally broad (4–8 mm.) and truncate-subcordate; plant of northeastern Molokai.....var. *ε. waikoluensis*
    c. Leaves rarely somewhat subrhomboidal, few basally broad or truncate-subcordate.....var. *η. kohalana*
  b. Leaves broadly to narrowly obovate.
    c. Many leaves indented once on each side near apex (with a resulting broad short terminal often emarginate lobe).....var. *β. Stokesii*
    c. Leaves never (or in var. *γ. moomomiana* rarely) thus indented.
      d. Leaves very numerous and conspicuously imbricate-distichous, more often reflexed; capitula solitary or 2–5 on thickened and abbreviated axillary axis; plant of western Molokai and Kaula.....var. *γ. moomomiana*
      d. Leaves otherwise.
        e. Leaves thickish; plant of Nihoa, Niihau, and westernmost Kauai.....*E. Celastroides*
        e. Leaves thinner, at least when dry; plant of easternmost Kauai.....var. *θ. kealiana*
a. Leaves oval or obovate to linear, commonly less than 1.5 cm. wide (or if a few cauline leaves wider, then rameal leaves very numerous and branchlets prominently ridged and often with additional diminutive bracting leaves —var. *ι. halawana*).
  b. Involucral pedicels capillary, somewhat flexuous, becoming 1.5–1.8 cm. long.....var. *μ. nematopoda*
  b. Involucral pedicels (if present) stouter or shorter or both.
    c. Capitula in poly(±11)-cephalous cymes.....var. *ο. niuensis*

c. Capitula mostly 1–7 at a node.
d. Capitula usually many to a branchlet, each node of which may bear a short slender flowering axis in one axil.
e. Capitula mostly 1 to a node, pedicel ±13 mm. long..var. λ. *Humbertii*
e. Capitula (at least in well developed specimens) mostly in 2–7-cephalous cymes.
f. Cymes much contracted, their axis and branches thickish and nodose (and thus numerously stipulate-bracted), capitula sessile to subsessile.....var. δ. *kaenana*
f. Cymes open, the branches slender, capitula pedicelled.
g. Leaves noticeably divaricate (except for terminal 1 or 2 pairs, which are antrorse) and distichous, more or less falcate, often 5–7 cm. long.....var. ν. *lorifolia*
g. Leaves directed variously, not or scarcely falcate, seldom more than 5 cm. long.....var. ξ. *hanapepensis*
d. Capitula few to a branchlet.
e. Capitula sessile or subsessile (pedicel less than 2 mm. long).
f. Mature seeds mostly tetragonal, 1.7–2 mm. long.
g. Leaves mostly broad-obovate to almost rotund.
h. Leaves densely crowded, ultimate branches (unless in form *kahanana)* mostly short and thick like penultimate ones, involucres usually sessile, capsules glabrous or nearly so; plant of northeasternmost Molokai and (f. *kahanana)* eastern Oahu.....var. ι. *halawana*
h. Leaves fewer, ultimate branches mostly slender (1–1.5 mm. thick) and thus abruptly unlike penultimate ones, involucres usually subsessile, capsules appressedly and more or less arachnosely whitish-hispid (finally glabrate at some places); plant of northwestern Hawaii.....var. κ. *saxicola*
g. Leaves mostly oblanceolate or narrower.....var. π. *amplectens*
f. Mature seeds mostly biconvex, 1.4–1.6 mm. long....var. ρ. *mauiensis*
e. Capitula all or many definitely slender-pedicellate (pedicel 4–7 mm. long).....var. ζ. *haupuana*

Shrub, glabrous, glaucous, spreadingly branched and often forming dense mats; branches rather closely but not widely nodose, often reddish. Leaves opposite and distichous, sometimes a few pairs imbricately crowded at tips of branches, the rather narrow petiole concave or channeled on upper surface and about 2–4 mm. long; blade spatulately cuneate-obovate to oblong-oblanceolate (often with one edge concave and one convex), obtuse to orbicular at apex but not or scarcely retuse, gradually narrowed below to a slender truncate-subcordate base, at margin entire and at times somewhat upturned, somewhat rigid, commonly 2.5–5.5 cm. long and 1–2.5 cm. wide, the

lateral veins more or less obscure on upper surface; stipules coalesced into a single interpetiolar body on each side, this very broad, short, more or less ciliate. Cymes axillary, 1–5-cephalous. Involucre hemispherical, many-flowered, glabrate outside unless at lobes, hirtous inside along lines running from the glands, about 2.3 mm. tall; glands 4 or 5, yellowish-brown when dry (or yellow on living specimens); transversely deltoid-oblong to suborbicular, exappendiculate; stamens exserted; pedicel slender, glabrous, usually becoming about 1 cm. long. Capsule subsessile, blackish or black, trigonal, depressed, about 2.5 mm. tall; cocci scarcely carinate; styles very short, bifurcate about one third the way into thickish apically capitate branches; seeds reddish-gray, obscurely 4-sided, ovate in side view, minutely scrobiculate, about 1.5 mm. long.

Type: Collected by *Jules Remy,* Niihau, 1851–1855 (Paris).

Distribution: Nihoa, Niihau, and western coast of Kauai.

Specimens examined: *Edwin H. Bryan, Jr. 6,* abundant patches on summit and a few plants on southeast point, Nihoa, June 14, 1923 (Bishop); *Edward L. Caum 64,* alt. ±100 m. and ±300 m., among rocks on edge of windswept cliffs, Nihoa, June 17, 1923 (Bishop); *Otto Degener 8090,* growing only on sand dunes in hot arid region, north of Barking Sands, Kauai, June 13, 1926 (Degener, 2 sheets; Field); *C. S. Judd 5,* alt. 140 m., steep rocky hillside, Nihoa, June 20, 1923 (Bishop); *John F. G. Stokes,* Kaali, Niihau, January, 1912 (Bishop).

Boissier omits the color of the capsules but these are found to be blackish or even black on the fruiting specimens examined *(Bryan 6* and *Degener 8090).*

Perhaps hybridizing, through one of its varieties, with *E. Hillebrandii (cf. Otto Degener, Kwan Park & Will Bush 8042,* moderately dry region, small gulch on south side of upper Makua Valley, Oahu, May 10, 1931 [Degener; New York]; *Albert F. Judd & Carl Skottsberg 366,* slope of Puu Kaala, Makaleha, Oahu, August 30, 1922 [Gothenburg]), and with *E. multiformis* var. *manoana (cf. Charles N. Forbes 2472-O,* ridges between Niu and Wailupe, Oahu, April 11, 1917 [Bishop]; *Otto Degener, Kwan Park, D. LeRoy Topping & Otto Swezey 8100,* top of ridge in open sunny woods, middle ridge of Niu Valley, Oahu, June 4, 1932 [Degener; Field, 2 sheets; N. Y.]).

Euphorbia Celastroides var. β. **Stokesii** (Forbes) Sherff, Bot. Gaz. **97**: 593. 1936.

Euphorbia Stokesii Forbes, Bishop Mus. Occas. Paps., **5**: 108, *pl. 1.* 1913.

Low prostrate shrub 6 dm. tall; branches slender and terminally subherbaceous somewhat as in *E. multiformis*. Leaves obovate, often emarginate (some having the terminal portion partly set off from rest by an additional indentation on each side), somewhat fleshy, bluish-green above, paler beneath, 3–4.2 cm. long and 2–2.8 cm. wide, moderately membranaceous when dry. Capitula solitary, axillary; pedicel 1–1.5 cm. long. Capsule glabrous, 3 mm. tall.

Type: Collected by *John F. G. Stokes*, near the beach at Kii, Niihau, January, 1912 (Bishop).

Distribution: Northeasternmost Niihau and northeastern Kauai.

Specimens examined: *Stokes*, near beach at Kii, Niihau, January, 1912 (cotype, Bishop); *Stokes*, near Kalihiwai, Kauai, February, 1916 (Bishop).

Characterized by its more slender branchlets, the often present low terminal foliar lobe (manifest because of the two additional emarginations), and by its greenish capsules. Connected with *E. Celastroides* too well, however, by the variety *moomomiana*, which unites, for example, the green capsules and, though only to a slight extent, the terminal leaf lobe (characters of var. *Stokesii)* with a robust branching habit and, though only to a slight extent, imbricately crowded leaves (characters of the species proper).

Euphorbia Celastroides var. γ. **moomomiana** Sherff, Bot. Gaz. **97**: 593. 1936. (Pl. 4.)

Much branched; branches reddish, thick, very densely leaved, internodes commonly 3–6 mm. thick and twice or thrice as long. Leaves conspicuously distichous and imbricate, more often reflexed; blade somewhat rigid, obovate, at apex rounded or truncate sometimes emarginate (rarely with an additional small sinus a few mm. to each side of the midrib's terminus), gradually narrowed to a minutely auriculate-cordate base, at margin entire and somewhat revolute, bluish-green, paler beneath, 3–4.8 cm. long and 1.8–2.8 cm. wide; stipular body marginally fimbriate-hispid, 1.5–3.2 mm. tall. Capitula solitary and axillary or 2–5 on thickened abbreviated axis arising from

an axil; pedicel glabrous, ±1 cm. long. Capsule about 2 mm. tall and almost 3 mm. thick.

Type: Collected by *Joseph F. Rock,* no. *14014,* Moomomi, Molokai, April, 1918 (Bishop, 3 sheets).

Distribution: Western Molokai and Kaula, islet off Niihau.

Specimens examined: *Edward L. Caum 10,* Kaula, islet off Niihau, August 17, 1932 (Bishop); *Otto Degener 8069,* forming 1 × 2-yard mass, in pure sand on lee-ward side of large dune, extremely dry region, Moomomi, Molokai, April 25, 1928 (Degener, 2 sheets; Field; New York); *George C. Munro 494,* Moomomi sand hills, Molokai, July 26, 1922 (Bishop); *Rock 14014* (3 type sheets, Bishop).

The *Munro* plant appears to have been regarded as new by Rock, but at the Bishop Museum both the *Munro* and the *Rock* plants had been referred to the deceptively similar *Euphorbia Stokesii* (my variety *Stokesii).* The latter plant differs strongly, however, in having: rameal internodes much shorter and thicker; the much more numerous leaves so close that in the herbarium specimens they present a highly imbricated effect, their blade only very rarely with an indentation on each side of and a few millimeters from the midnerve's distal end; the tendency to bear thickened abbreviated axillary branches which are mere axes to hold the capitula; the shorter capsule, etc.

Euphorbia Celastroides var. δ. **kaenana** Sherff, Bot. Gaz. **97:** 594. 1936. (Pl. 5.)

Shrub with thick very nodose branches, bark often whitish-gray and, when dry, lengthwise much wrinkled. Leaves somewhat clustered over distal third or half of the much reduced thickish (2–4 mm.) ultimate branchlets, lower ones often reflexed; petiole slender, glabrous, 2–3 mm. long; blade broadly to narrowly oblong-oblanceolate, at apex obtuse to truncate-subemarginate, cuneately or subcuneately narrowed below to an oblique and truncate-subcordate base (this 3–5 mm. wide), pale green, thin, mostly 3–4.5 cm. long and 1–1.6 cm. wide. Cymes much contracted, their axis and branches thickish and nodose (the numerous stipular bracts very obvious); capitula often 5–7, sessile to subsessile; involucre outwardly glabrate or minutely setulose except for the hirsute lobes. Capsule sub-

sessile, glabrate, drying blackish, about 2.5 mm. tall; seeds grayish over red undercoat, biconvex-tetragonal, scrobiculate, obliquely tetragonal at each end, 1.2–1.4 mm. long.

Type: Collected by *Vaughan MacCaughey,* Kaena uplands, Oahu, March 28, 1915 (Bishop).

Distribution: Northwesternmost Oahu.

Specimens examined: *Otto Degener, W. Hirai,* and *Kwan Kee Park 8038,* among rocks in arid region, near Kaena Point, Oahu, March 21, 1931 (Degener; Field; New York); *Charles N. Forbes 1654-O,* between Makua Valley and Kaena Point, Oahu, February 25, 1911 (Field); *Forbes* (with *Dean Lake) 2280-O,* talus slopes, Kaena Point, Oahu, December 16, 1915 (Bishop); *MacCaughey,* Kaena uplands, Oahu, March 28, 1915 (type, Bishop).

Euphorbia Celastroides var. ε. **waikoluensis** Sherff, Bot. Gaz. **97**: 594. 1936.

Shrub with moderately slender reddish branches. Leaves moderately numerous but seldom imbricate, pale or glaucescent, the dark and minutely puberulous petiole only about 1–2 mm. long; blade subrhombic-oval, apically obtuse to rounded and sometimes slightly emarginate, basally broad (4–8 mm.) and truncate-subcordate, commonly 2.5–3.8 cm. long and 1.5–2.5 cm. wide. Capitula (only a few seen) solitary or subsolitary, axillary or terminal, the involucre pubescent especially above; pedicel short (1–3 mm.). Capsule (a single immature one seen) black.

Type: Collected by *Joseph F. Rock,* no. *6191,* on beach of Waikolu, Molokai (Field).

Distribution: Northeastern Molokai.

Specimens examined: *Rock 6191* (type, Field: cotype, Field).

Euphorbia Celastroides var. ζ. **haupuana** Sherff, Bot. Gaz. **97**: 594. 1936.

Doubtless a shrub; the woody branches slender, grayish-black, the ultimate ones numerously and conspicuously nodose (their internodes mostly 3–7 mm. long and 1–2.5 mm. thick). Leaves as in species proper and somewhat crowded at ends of branches but smaller (blade commonly under 3 cm. long and 2 cm. wide) and at apex commonly obtuse very rarely retuse. Capitula usually not more than 1 or 2 at a node, the slender

glabrous pedicel 4–7 mm. long. A single very immature capsule observed, this black.

Type: Collected by *Joseph F. Rock,* no. *2444,* Haupu-Lihue, Kauai, March 18, 1909 (Bishop).

Distribution: Southeastern Kauai.

Specimens examined: *Charles N. Forbes 20-K pro parte,* near Lihue, Kauai, July 9, 1909 (Field); *Forbes 600-K,* Nonou Mountains, Kauai, October 16–17, 1916 (Field); *Rock 2444* (type, Bishop: cotype, Gray).

Euphorbia Celastroides var. *η*. **kohalana** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 595. 1936.

A shrub of open branching habit; the reddish branches slender and with long internodes (often 2–4 cm.), the nodes inconspicuous; ultimate branches very slender (±1 mm. thick), moderately leafy and often bearing 1 or 2 very short-pedicellate (1–3 mm.) capitula at the tip and at 1 or 2 nodes. Leaves more narrowly petiolate; the blade from oval to obovate (rarely somewhat subrhomboidal), at apex rounded to emarginate, bluish-green or glaucescent, at the more or less oblique base narrowly or widely rounded to truncate-subcordate, 2.5–4 cm. long and 1.5–2.5 cm. wide.

Type: Collected by *Otto Degener,* no. *8037,* Kohala, Hawaii, March 22, 1930 (Delessert).

Distribution: Northwestern Hawaii.

Specimens examined: *Degener 8037* (type, Delessert: cotypes, Field, 2 sheets; New York); *Rock 14032,* without data (Bishop; a specimen without flowers or fruits and with the leaves mostly less blunt or rounded at apex).

Euphorbia Celastroides var. *θ*. **kealiana** Sherff, Bot. Gaz. **97**: 595. 1936.

Doubtless a shrub and more or less matting; branches blackish, nodes numerous and conspicuous, internodes now 3–7 mm. now ±1 cm. long and ±3 mm. (or for ultimate branches 1–1.5 mm.) thick. Leaves as in species proper but drying thinner, blade becoming 5 cm. long and 3.3 cm. wide, probably somewhat differently colored. Capitula not seen.

Type: Collected by *Abbé Urbain Faurie,* no. *477,* on rocks of the shore at Kealia, Kauai, January, 1910 (British).

Distribution: Southeastern Kauai.

Specimens examined: *Faurie 477* (type, British: cotype, Paris); *Charles N. Forbes 20-K pro parte,* near Lihue, Kauai, July 9, 1909 (Field).

Euphorbia Celastroides var. ι. **halawana** Sherff, Bot. Gaz. **97**: 596. 1936. (Pl. 6.)

A much-branched and very leafy shrub, doubtless often forming mats; the ultimate and subultimate reddish branches lengthwise much wrinkled and ridged at least when dry, their internodes mostly 1–2 mm. thick. Leaves more persistent on branchlets than in species proper and foregoing varieties, with a brownish tinge when dry, averaging much smaller; petiole slender, 1–2 (rarely –3) mm. long; blade variously oval-obovate, subrhombic-obovate, or suborbicular, at apex rounded to truncate-emarginate, at the oblique and usually widish base rounded to truncate-subcordate, for a few cauline leaves up to 3.5 cm. long and 2 cm. wide but for the multitude of rameal smaller ones mostly 1–2.5 cm. long and 0.8–2 cm. wide (or *for the minute often numerous leaves subtending capitula* down to ±4 mm. long and to ±4 mm. wide). Capitula subsessile, usually solitary, often borne at and near tip of diminutive leafy-bracted lateral branchlet; involucre outwardly tomentose at least above. Capsule glabrous or slightly pubescent, greenish-brown, sessile or apparently so, ±3 mm. tall; seeds grayish, scrobiculate, 2 mm. long.

Type: Collected by *Joseph F. Rock,* no. *14041,* near Halawa, Molokai, April, 1918 (Bishop).

Distribution: Northeasternmost Molokai.

Specimens examined: *Otto Degener 8054,* dry coastal cliffs, west side of Halawa Valley, Molokai, June 20, 1928 (Field, 2 sheets); *Abbé Urbain Faurie 472,* on shore at Halawa, Molokai, June, 1909 (British; Paris); *Rock 14041* (type, Bishop: cotype, Bishop).

Euphorbia Celastroides var. **halawana** f. 1. **kahanana** Sherff, Bot. Gaz. **97**: 596. 1936.

Branchlets less roughened or ribbed when dry, leaves more numerous, inflorescences more often subtended with very small leaves.

Type: Collected by *Otto Degener,* no. 8036, on sunny ridge, west slope of Kahana Valley, Oahu, February 26, 1929 (Degener).

Distribution: Known only from type locality on Oahu.

Specimens examined: *Degener 8036* (type, Degener; cotypes, Field; N. Y.).

Euphorbia Celastroides var. κ. **saxicola** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 596. 1936.

Euphorbia oahuensis Skottsberg, Meddel. Göteb. Bot. Trädg. **10**: 122. 1936 *(ex syn.* Hillebr. but excluding Skottsberg's plant).

Somewhat resembling the variety *halawana* in habit. Leaves averaging slightly smaller and more often obovate, with apex emarginate. Involucre commonly with a short (1–4 mm.) but manifest pedicel. Capsule (sessile) drying brownish-black to black.

Type: Collected by *Otto Degener,* no. 8088, along rocky shore, Kohala, Hawaii, August 9, 1926 (Delessert).

Distribution: Northwestern Hawaii and southeastern Oahu.

Specimens examined: *Degener 8088* (type, Delessert: cotypes, Degener, 2 sheets; Field); *Dr. William Hillebrand,* Kailua, Oahu (Berlin; type of *Euphorbia oahuensis* Skottsberg).

Euphorbia Celastroides var. λ. **Humbertii** Sherff, Bot. Gaz. **97**: 596. 1936.

Probably a shrub; branches ascending, slender, ultimate ones mostly 1–1.6 mm. thick at internodes (these more often 3–9 mm. long), nodes conspicuous. Leaves moderately crowded on distal third or half of each branchlet, the slender petiole 2–4 mm. long; blade cuneately and often subfalcately oblanceolate, apically obtuse to truncate or rounded but seldom retuse, basally oblique-truncate and only about 1.5–3 mm. wide, bluish-green or glaucescent, thinnish, commonly 2–4 cm. long and 0.7–1.5 cm. wide. Capitula abundant but usually only 1 or 2 at a node, mostly elongate-pedicellate; involucre outwardly glabrate, pedicel slender, rigid, suberect, and finally ±13 mm. long. Capsule glabrous, sessile or apparently so, ripening brownish-black, about 2.5 mm. tall.

Type: Collected by *Jules Remy,* no. *595,* Kauai, 1851–1855 (Gray).

Distribution: Oahu and Kauai.

Specimens examined: *Thomas Nuttall*, Parri ("probably Nuuanu Pali"), Oahu (Kew; type material of *Euphorbia annulata* Nutt. ined.); *Remy 595* (type, Gray: cotypes, Paris, 2 sheets); *U. S. Explor. Exped.*, Oahu, 1840 (Gray; Missouri; U. S.).

Named for Professor H. Humbert of Paris, without whose invaluable assistance my treatments of this and several other members of the genus *Euphorbia* would have been greatly handicapped if not precluded.

Euphorbia Celastroides var. μ. **nematopoda** Sherff, Bot. Gaz. **97**: 597. 1936.

Similar to var. *Humbertii*. Differs in its less crowded leaves, fewer capitula, these on more flexuous, not rigid and suberect, even more delicate, and a third to a half longer pedicels.

Type: Collected by *Charles N. Forbes*, no. *726-K*, at left-hand side of Kipu Kai Gap, Haupu Range, Kauai, November 1, 1916 (Bishop).

Distribution: Known only from type locality in southeastern Kauai.

Specimens examined: *Forbes 726-K* (type, Bishop).

Euphorbia Celastroides var. ν. **lorifolia** (A. Gray) Sherff, Bot. Gaz. **97**: 597. 1936.

Euphorbia multiformis var. *lorifolia* A. Gray *ex* H. Mann, Proc. Amer. Acad. **7**: 202 (Enum. Haw. Pl., no. 439, var. δ.). 1867.

Euphorbia lorifolia Hillebrand, Fl. Haw. Isls., p. 395. 1888, only as to syn. A. Gray.

Euphorbia rivularis Heller, Minn. Bot. Studs. **1**: 846, *pl. 51*. 1897.

Chamaesyce lorifolia (A. Gray) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936 *(ex syn. Hillebr. quoad Hillebr. syn. A. Grayi utitur)*.

A shrub 1.5–1.8 m. tall, simple below with a stem ±2.5 cm. thick; branches loose, spreading. Differs from variety *Humbertii* in its more conspicuously distichous, more elongate, more often falcate leaves, these often 7 cm. long; also in its commonly more compound inflorescence (often with 3–5-cephalous cymes) and shorter pedicels, these latter mostly ±5 mm.

long. Seeds tetragonal, grayish over red undercoat, distinctly scrobiculate.

Type: Collected by the *United States Exploring Expedition*, Kauai, 1840 (U. S.).

Specimens examined: *Anon.*, Kauai (Bishop, fragment *ex* Berlin); *anon. 415*, near Waimea Canyon, Kauai, June 29, 1928 (Field); *Brodie 4036*, Kauai (Field); *Otto Degener H-212*, near rain forest along irrigation ditch road, Olokele Canyon, Kauai, September 9, 1922 (New York); *Degener 8086*, Olokele Canyon, Kauai, July 3, 1926 (Degener, 3 sheets; Field); *Degener 8091*, rather dry region, northeast of Kipu, Kauai, June 17, 1926 (Degener, 3 sheets; Field); *Degener 8092*, near Hanapepe Falls, Kauai, June 19, 1926 (Degener, 2 sheets; Field; New York); *Abbé Urbain Faurie 465*, Waimea, Kauai, March, 1910 (Paris); *Faurie 466*, Naapali, Kauai, January, 1910 (British; Paris); *Charles N. Forbes*, Olokele Valley, Kauai, September, 1909 (Bishop); *Forbes 944-K*, Halemanu, Kauai, July 3–August 18, 1917 (Field, 2 sheets); *Amos Arthur Heller*, on Kaholuamanu, above Waimea, Kauai, September 2–9, 1895 (Field); *Heller 2441*, on the Hanapepe and Wahiawa Watershed, Kauai, June 25, 1895 (Kew); *Heller* (similarly) *2441*, along the Hanapepe River, near the Falls, Kauai, June 24–26, 1895 (cotypes of *Euphorbia rivularis* Heller, Cornell; Field, 3 sheets; Gray; New York; Paris); *Heller* (similarly) *2441*, same locality, July 2–8, 1895 (Missouri); *Dr. William Hillebrand*, Hawaiian Isls. (Gray; Kew); *Albert S. Hitchcock 15251*, alt. 1400 ft., Olokele Gulch, Kauai, October 18, 1916 (U. S.); *Knudsen*, Kauai (Berlin); *Archibald Menzies*, Hawaiian Isls. (Kew); *Joseph F. Rock 2080*, Halemanu, Kauai, February 14–26, 1909 (Bishop; Gray; New York); *Rock 5564*, Kaholuamanu, Kauai, September, 1909 (Bishop; Gray; New York; Vienna); *Rock 12938*, same locality, October, 1916 (Bishop); *Rock 17257*, Hawaiian Isls. (Bishop); *Carl Skottsberg 1001*, in the forest near Kokee station, Kauai, October 28, 1922 (Bishop); *U. S. Explor. Exped.*, Kauai, 1840 (type, U. S.: type fragments, Gray; Missouri).

The leaves tend to stand "at right angles to the branch, except the ultimate ones, which extend forward" (Heller, *loc. cit.)*.

Our concept for the variety *lorifolia* must rest directly upon Asa Gray's manuscript description published by Horace Mann (and its underlying type plant collected by the United States Exploring Expedition): "Var. δ *lorifolia* (Gray, *l. c.* ined.): foliis lineari-elongatis (bipollicaribus) crassis; pedicellis involucro 2–4-plo longioribus."

Mann erroneously referred *Mann & Brigham 389* to the variety *lorifolia*, and subsequent botanists, beginning with Hillebrand, seem uniformly to have rested their concept for *lorifolia* upon the *Mann & Brigham* plant. We may note, however, that that very keen student of Euphorbiaceae, Dr. George Engel-

mann, made a carefully detailed study of a fragment of the type of variety *lorifolia,* and that his extended description, in pencil, is on a slip attached to his private herbarium sheet (Missouri). He studied also *Mann & Brigham 389* and wrote: "seed different from *lorifolia* and very distinct."

The *Mann & Brigham* plant is referred by me to variety *mauiensis.* The true variety *lorifolia* is seen to be the plant described by Heller *(loc. cit.)* as *Euphorbia rivularis.*

Euphorbia Celastroides var. ξ. **hanapepensis** Sherff, Bot. Gaz. **97**: 597. 1936. (Pl. 7.)

Euphorbia Celastroides Heller, Minn. Bot. Studs. **1**: 844. 1897 (not Boiss.).

A small tree with short trunk, loosely branching; the smaller or younger branches stiff and with short (commonly 5–12 mm.) internodes, brownish-black or grayish-black at least when dry. Leaves somewhat crowded toward tips of branchlets, petiole slender and 1–4 mm. long; blade linear-oblanceolate to broadly oblanceolate, at apex rounded to subobtuse, at base narrow (usually less than 3 mm. wide), thinner and more greenish above than in species proper and somewhat yellowish-silvery beneath, 2–5 cm. long and 0.7–1.7 cm. wide. Capitula much more numerous than in species proper, solitary at the nodes or more often in 2–5-cephalous cymes (these in axils of abbreviated leafy lateral branchlets); involucre outwardly glabrous; pedicel slender, glabrous, 3–8 mm. long. Capsule glabrous, drying dark brown, sessile or apparently so; seeds grayish, scrobiculate.

Type: Collected by *Amos Arthur Heller,* no. *2429,* along the Hanapepe River, near the Falls, Kauai, July 2–8, 1895 (Missouri).

Distribution: Southeastern Kauai.

Specimens examined: *Abbé Urbain Faurie 476,* on rocks, Hanamaulu, Kauai, December, 1909 (Bishop; Delessert; Paris); *Heller 2429,* along the Hanapepe River, near the Falls, Kauai, June 24–26, 1895 (Cornell; Field, 2 sheets; Gray; New York; Paris); *Heller* (similarly) *2429,* on the Hanapepe and Wahiawa Watershed, Kauai, June 24, 1895 (Kew); *Heller* (similarly) *2429,* along the Hanapepe River, near the Falls, July 2–8, 1895 (type, Missouri: cotype, U. S.).

A form which might be taken for a distinct species if it were not connected with the species proper by such a complete series of intermediate varieties.

Euphorbia Celastroides var. ο. **niuensis** Sherff, Bot. Gaz. **97**: 598. 1936.

Similar to var. *lorifolia*. Leaf petioles slender, glabrate, 2–3 mm. long; blade oblong, at apex obtuse or rounded, at base oblique-truncate and 3–5 mm. wide, glaucescent, thinnish, ±2.5 cm. long and ±1.2 cm. wide. Capitula ±11 in tiny cymes (these ±1.5 cm. long, the branches spreading or recurved; pedicels slender but short, commonly 1–4 mm. long). Capsules drying dark brown, glabrous, sessile or apparently so, about 2 mm. tall. Seeds grayish over red undercoat, tetragonal, only about 1–1.1 mm. long, only moderately or even indistinctly scrobiculate.

Type: Collected by *Dr. William Hillebrand,* Niu, Oahu (Berlin).

Distribution: Southeastern Oahu.

Specimens examined: *Hillebrand*, Niu, Oahu (type, Berlin).

Perhaps now extinct. The type is a mere fragment but very distinctive. It is the specimen referred to by Hillebrand (Fl. Haw. Isls., p. 395. 1888) for Oahu material of *Euphorbia Celastroides*. I have found no other material to match it.

Euphorbia Celastroides var. π. **amplectens** Sherff, Bot. Gaz. **97**: 598. 1936. (Pl. 8.)

Euphorbia lorifolia Hillebr., Fl. Haw. Isls., p. 395. 1888 (in small part and excluding syns. A. Gray and DC.; *cf.* var. *mauiensis*).

Now a prostrate or erect shrub, now arborescent, much branched; ultimate and penultimate branches grayish-black, puberulous, not strongly ridged, the numerous nodes conspicuous, internodes mostly 1–2 mm. thick. Leaves of various aspects, but mostly with short (1–3 mm.) slender commonly pubescent petiole; blade mostly elliptic-oval to narrowly oblanceolate, at apex truncate and perhaps emarginate to rounded or obtuse, at base rounded or narrowed, with a more or less

brownish tinge to the green when dry, at times puberulous beneath toward petiole, mostly 1.5–3 cm. but sometimes to 6 cm. long. Capitula usually solitary, subsessile; involucre outwardly glabrous or glabrate below, often pubescent to conspicuously tomentose above. Capsule glabrous to moderately puberulous, sessile or apparently so, drying brownish-green to dark brown, about 3 mm. tall. Seeds now definitely tetragonal, now compressed and 2-edged except at the tetragonal truncate base, apically obtuse, grayish (over the red undercoat), scrobiculate, 1.7–2 mm. long.

Type: Collected by *Charles N. Forbes,* no. *355-Mo,* Kaluaaha Valley, Molokai, August, 1912 (Field).

Distribution: Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii.

Specimens examined: *Anon. 375,* shrub about 4–6 ft. tall, Pololu Gulch, Kohala, Hawaii (Field); *Otto Degener 8043,* windswept ridge at beginning of forest, east ridge of Niu Valley, Oahu, April 20, 1931 (Degener; Field; New York); *Degener 8055,* growing 3.5–5 ft. tall, with *Santalum,* Mokomoko Gulch, Molokai, June 7, 1928 (Degener); *Degener 8057,* shrub 3 ft. tall, growing with *Lipochaeta Degeneri* in hot boulder-strewn region not far from ocean, near Kamakaipo, Molokai, May 16, 1928 (Degener); *Degener 8058,* on moderately dry rocky slope, growing with *Exocarpus,* Kahuaawi Gulch, Molokai, May 12, 1928 (Degener; Field; New York); *Degener 8060,* East Ohia ridge, Molokai, July 17, 1928 (Degener; Field; New York); *Degener 8062,* one of the dry valleys between Kamalo and Kaunakakai, Molokai, July 29, 1928 (Degener; Field; New York); *Degener 8070,* Moomomi, Molokai, April 25, 1928 (Degener); *Degener 8076,* dry rocky region, Kaupo Gap, Haleakala, Maui, August 20, 1927 (Degener; New York); *Degener 8077,* northwest of Puu Eke, Maui, August 31, 1927 (Degener, 2 sheets; Field; New York); *Degener 8078,* arid rocky region, Ulupalakua, Maui, June 23, 1927 (Degener, 2 sheets; Field; New York); *Degener 8087,* arid *aa* lava desert, Hoopuloa, Hawaii, August 26, 1926 (Degener, 3 sheets; Field); *Degener 8089,* in tapestry forest, Kohala ditch trail, Kohala, Hawaii, August 10, 1926 (Degener, 3 sheets; Field); *Degener & Kwan Kee Park 8045,* in arid rocky sunny region, second ridge east of Kuliouou Valley, near summit (ridge on west side of Kamehameha Farm School), Oahu, October 25, 1931 (Degener, 2 sheets; Field); *David Douglas 13,* Hawaiian Isls., 1834 (Kew, 2 sheets); *Frederick Eschscholtz,* Oahu, 1816–1817 (Kew; form with leaves closely approaching those in *E. multiformis); Abbé Urbain Faurie 471,* on rocks, Yao Valley, Maui, August, 1909 (British; Paris); *Charles N. Forbes 17-Mo,* Kalehu, Molokai, June, 1912 (Bishop); *Forbes 43-L,* mountains near Koele, Lanai, June, 1913 (Field, 2 sheets); *Forbes 93-M,* Iao Valley, West Maui, June, 1910 (Field); *Forbes 255-L,* Limestone Point, Lanai, December 13, 1913 (Bishop); *Forbes 273-M,* beach at Kipahulu, East Maui, July, 1910 (Bishop); *Forbes 314-L,* Lanai, September, 1917 (Field); *Forbes 355-Mo* (type, Field: cotypes, Field; Missouri); *Forbes 358-H,*

Kanahaha, Kona, Hawaii, July 25, 1911 (Bishop); *Forbes 480-M*, Honokohau Drainage Basin, Maui, September 25–October 17, 1917 (Field); *Forbes 533-Mo*, Halawa, Molokai, September, 1912 (Field); *Forbes 1511-O*, Koko Head, Oahu, June 11, 1909 (Bishop); *Forbes 1666-O*, Puu-O-Kona, Oahu, March 14, 1911 (Field); *Forbes 1775-M*, Kaapahu, Maui, December 9, 1919 (Bishop); *Forbes 1877-M*, Nuu, south slope of Haleakala, Maui, March 6, 1920 (Field); *Forbes 1913-M*, same locality, March 9, 1920 (Field); *Forbes 2386-M*, Olowalu Valley, Maui, May 16, 1920 (Field); *Forbes 2529-O*, Wailupe, Oahu, January, 1919 (Bishop); *Charles Gaudichaud*, Hawaiian Isls. (Missouri, fragment *ex herb.* Delessert); *Dr. William Hillebrand*, Molokai, June 21 (Berlin; labeled *Euphorbia lorifolia* by Hillebrand); *Hillebrand 48*, Hawaii (Kew); *Albert S. Hitchcock 14484*, shrub or small tree on lava flow, Puuwaawaa, Hawaii, August 30, 1916 (Bishop; U. S.); *James Macrae*, Maui, May, 1825 (Missouri); fragment *ex herb. Kunthii; Macrae*, Oahu, May 20, 1825 (New York); *Horace Mann & William T. Brigham 101 pro parte*, Oahu, 1864–1865 (Field); *Mann & Brigham 427*, ridge east of Nuuanu Valley, Oahu, 1864–1865 (Bishop); *Maximowitsch 145*, Honolulu, Oahu (Berlin; Kew); *George C. Munro 45*, outer forest, Kaiholena, Lanai, August, 1913 (Bishop); *Munro 97*, Limestone point, Lanai, December 13, 1913 (Bishop); *Munro 705*, alt. about 1000 ft., Ulukolea, Mahana, north side of Lanai, September, 1925 (Bishop); *Munro 828*, alt. 1100 ft., Maunalei Valley, Lanai, August 5, 1930 (Bishop); *Jules Remy 592*, tree, forest of Kekaha, Hawaii, 1851–1855 (Paris); *Joseph F. Rock*, Hawaiian Isls. (Field, 2 sheets); *Rock*, Honokohau Valley, Maui (Bishop); *Rock 8068*, Hawaiian Isls. (Field); *Rock 8126*, Koele, Lanai, August 3, 1910 (Gray); *Rock 8359*, Hawaiian Isls. (Field); *Rock 8677*, East Maui (Field); *Rock 8679*, East Maui (Field); *Rock 17036*, prostrate, near the ocean, Barbers Point, Oahu, November, 1919 (Bishop, 2 sheets; Gray); *Carl Skottsberg 1953*, along road between Lind's and Puuwaawaa, Hawaii, September 26, 1926 (Bishop); *John F. G. Stokes*, Molokai, 1909 (Bishop); *D. LeRoy Topping* (Otto Degener distrib. no.) *8075*, Maui, August 5, 1927 (Degener; Field, 2 sheets; New York, 2 sheets); *Dr. Heinrich Wawra 1852*, Maui, 1868–1871 (Vienna, 2 sheets).

Similar to and apparently passing by many intergradations into the variety *mauiensis*, but with leaves tending to be more often obovate and less often linear, and with seeds commonly larger (1.7–2 mm., not 1.4–1.6 mm. long) and usually tetragonal (only rarely — for example, *Rock 17036* — obcompressed). Plants perhaps not averaging as tall as in variety *mauiensis*, but some of the specimens included here are from plants ±3.6 m. tall (for example, *Forbes 358-H*, "slender, 12 ft., drooping branches").

Apparently includes several forms or races (hence the name *amplectens*).

Euphorbia Celastroides var. ρ. **mauiensis** Sherff, Bot. Gaz. **97**: 601. 1936.

Euphorbia lorifolia Hillebr., Fl. Haw. Isls. 395. 1888 (in great part and exclud. syns. A. Gray and DC.; *cf.* var. *amplectens*).[1]

A shrub at lower altitudes to a small tree (3–6 m. tall and with trunk 1.5–2 dm. thick) in the upper regions, the stiff branches puberulous and nodose with short internodes. Leaves with short (1–2 mm.) puberulous petiole; blade linear to linear-oblong or rhombic-linear, apically obtuse to truncate and often retuse, basally somewhat contracted also subtruncate and oblique, glabrous or beneath especially toward base somewhat puberulous, 3–5 (less often to 7 or even to 9.5) cm. long, with a more or less brownish-green color when dry, the lateral veins ventrally dark and distinct. Capitula mostly solitary, sessile or subsessile; involucre outwardly pubescent. Capsule puberulous, subsessile, deeply 3-parted, drying brownish-green to dark brown, ±2.7 mm. tall. Seeds now obcompressed-tetragonal (two of the edges at times reduced to mere median ribs), now distinctly obcompressed and laterally 2-edged except at the tetragonal and truncate base, at apex shallowly rounded, brownish-gray to metallic-brown, scrobiculate, 1.4–1.6 mm. long.

Type: Collected by *Horace Mann & William T. Brigham*, no. *389*, on sandy isthmus of Maui, 1864–1865 (U. S.).

Distribution: Lanai and Maui.

Specimens examined: *Anon.*, Maui (Bishop, fragment *ex* Berlin); *Otto Degener 8074*, barren arid hill, *mauka* of *McGregor*, West Maui, July 10, 1927 (Degener; New York); *Abbé Urbain Faurie 474*, alt. 1500 m., Haleakala, Maui, August, 1909 (Paris); *Charles N. Forbes 115-L*, mountains near Koele, Lanai, June, 1913 (Bishop); *Forbes 139-L*, same locality and date (Field); *Forbes 223-L*, mountains at east end of Lanai, same date (Bishop; Field); *Forbes 366-L*, Kaiholena, Lanai, September, 1917 (Field, 2 sheets); *Forbes 1104-M*, Kaupo Gap, Haleakala Crater, Maui, August 10, 1919 (Field); *Forbes 1811-M*, Kanaio, south slope of Haleakala, Maui, March 2, 1920 (Bishop); *Forbes 1812-M*, same locality and date (Field); *Forbes 2048-M*, Auwahi, south slope of Haleakala, Maui, March 20, 1920 (Field);

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[1] Croizat & Degener (*ex* Deg., Fl. Haw. Dec. 9, 1936) give the new combination "*C. lorifolia* (Hillebr.) Croiz. & Deg." and cite "*E. lorifolia* Hilleb., Fl. Haw. Isls. 395. 1888" as their synonym. Of course this treatment is wholly ineffective under the International Rules of Nomenclature, so far as renaming Hillebrand's own plants (my var. *mauiensis*) is concerned. In actual effect, Croizat & Degener have made a new combination, though evidently not meaning to do so, for *Euphorbia multiformis* var. *lorifolia* A. Gray (*qu. vide*, p. 33).

Forbes 2091-M, Auwahi, south slope of Haleakala, Maui, March 24, 1920 (Field); *Forbes & C. Montague Cooke, Jr., 1-M*, Maunahooma, West Maui, May, 1910 (Bishop); *Dr. William Hillebrand 45*, small tree 15–20 ft. tall, Kula, East Maui, July, 1858 (Kew, 2 sheets); *Hillebrand & Rev. J. M. Lydgate*, Hawaiian Isls. (Bishop); *Dr. Albert S. Hitchcock 14809*, alt. 3000–5000 ft., Puu Kukui, West Maui, September 24–26, 1916 (Bishop; U. S.); *Horace Mann & William T. Brigham 389* (type, U. S.: cotypes, Bishop; Cornell; Field; Gray; Missouri); *George C. Munro 66*, Kaiholena, Lanai, August, 1913 (Bishop); *Munro 131*, outer forest, ridge behind Kaiholena, Lanai, September 28, 1913 (Bishop; Field); *Jules Remy 591*, Lanai, 1851–1855 (Paris); *Joseph F. Rock 8073*, Mahana, Lanai, July, 1910 (Field, 2 sheets; Gray; Vienna); *Rock 8560*, gulches above Makawao, Maui, September, 1910 (Field; Gray; New York); *Dr. Heinrich Wawra 2343*, Hawaiian Isls., 1868–1871 (Vienna); *Wawra 2527*, Maui, same date (Vienna); *Gerrit P. Wilder*, Maui, 1913 (Bishop).

As stated under the foregoing variety *amplectens*, that variety apparently passes into this. Because of the peculiarly obcompressed seeds, I had originally held this to be a valid species. The presence of forms of var. *amplectens*, however, in which most of the seeds are distinctly obcompressed (although still of greater length), seems to cast doubt upon the value here, for purposes of *specific* segregation, of the *obcompressed-seed* character. Anyway, the local and visiting botanists who have collected the two forms have very commonly confused them under the (as seen under var. *lorifolia*, erroneous) designation, *Euphorbia lorifolia*.

7. **Euphorbia olowaluana** Sherff, Bot. Gaz. **97**: 580. 1936.
Chamaesyce olowaluana (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Leaf petiole 1–2 mm. long; blade 1.5–2.5 (rarely –3) cm. long and 4–8 mm. wide; capsule glabrous.....*E. olowaluana*
Leaf petiole 2–3 mm. long; blade up to 6 cm. long and to 1.4 cm. wide; capsule pubescent.....var. *β. gracilis*

Shrub or perhaps a small tree, branched; branches brownish-gray (ultimate ones herbaceous, more often very slender, moniliform, glabrate or very minutely hispidulous, their nodes conspicuous). Leaves opposite and distichous, more often divaricate, the slender petiole weakly puberulous and 1–2 mm. long; blade oblongly linear, at apex obtuse or acute, at base oblique (but only about 1–2 mm. wide), membranous, glabrate,

marked underneath with oblique brownish-purple veins, 1.5–2.5 (rarely –3) cm. long and 4–8 mm. wide; stipular body at first triangular. Capitula commonly solitary in axils and also at tips of branchlets. Involucre subsessile, campanulate or urceolate, outwardly glabrate or near summit tomentulose, about 2.3 mm. tall; glands 4, transversely oblong, subcontiguous. Capsule cernuous, conspicuously trigonal, glabrous, brown, about 2.3 mm. tall; cocci weakly carinate, the keel darker; styles connate at base, shortly bifurcate with much-thickened branches; stipe pubescent, manifest. Seeds ovate, tetragonal, brown (at first rarely grayish), scrobiculate, 1.3–1.5 mm. long.

Type: Collected by *Charles N. Forbes,* no. *2341-M,* central ridge of Olowalu Valley, Maui, May 12, 1920 (Bishop).

Distribution: South-central West Maui.

Specimens examined: *Forbes 2242-M,* Olowalu Valley, Maui, May 7, 1920 (Field); *Forbes 2341-M* (type, Bishop).

Euphorbia olowaluana and its variety *gracilis* appear to constitute a species of somewhat questionable integrity, intermediate between *E. multiformis* (as to often acutish leaves) and its variety *microphylla* (as to herbaceous moniliform ultimate branchlets), on the one hand, and its variety *manoana* and *E. Celastroides* varieties *amplectens* and *mauiensis* (as to appearance of leaves, especially of the brownish-purple venation of their lower surface), on the other.

In view of the existence of so many varieties of *E. multiformis* and *E. Celastroides* as are known to occur, the recognition here of *E. olowaluana* and the variety *gracilis* as apart from them must needs be somewhat arbitrary.

Euphorbia olowaluana var. β. **gracilis** (Rock) Sherff, Bot. Gaz. **97**: 581. 1936.

Euphorbia lorifolia var. *gracilis* Rock, Indig. Trees Haw. Isls., p. 259, *pl. 100.* 1913.

Tree, often 6–9 m. tall; stem often 2.5–3 dm. in diameter, covered with a thinnish pinkish bark, this at first smooth but finally often strewn with conspicuous nodular excrescences; branches very slender and drooping, internodes glabrate or

pubescent, nodes usually puberulent. Leaves larger, petiole 2–3 mm. long; blade linear-oblong, up to 6 cm. long and to 1.4 cm. wide. Involucre outwardly hispidulous especially above; capsule pubescent.

Type: Collected by *Joseph F. Rock,* no. 3593, on lava back of Puuwaawaa, North Kona, Hawaii, June, 1909 (Bishop).

Distribution: Hawaii and West Maui.

Specimens examined: *C. J. Austin,* Puuwaawaa, Hawaii, 1912 (Bishop); *Otto Degener 8087,* arid *aa* lava desert, same locality, August 24, 1926 (Degener); *Charles N. Forbes 6-H,* same locality, June 8–14, 1911 (Bishop); *Forbes 463-H,* slopes of Mauna Kea, Waiki, Hawaii, August, 1911 (Bishop); *Forbes & C. Montague Cooke, Jr., 1-M,* Maunahooma, West Maui, May, 1910 (Bishop); *Albert S. Hitchcock 14270,* Koa forest, Kukaiau Ranch, Hawaii, August 20, 1916 (Bishop; U. S.); *Hitchcock 14809,* tree in upper forest, alt. 3000–5000 ft., Puu Kukui, Maui, September 24–26, 1916 (U. S.); *Alfred Meebold,* alt. 5000 ft., Hualalai, Hawaii, May, 1932 (Bishop); *Meebold,* Hualalai, November, 1935 (Field); *George C. Munro,* Puuwaawaa, Hawaii, June 7, 1923 (Field); *Joseph F. Rock,* same locality, August, 1917 (Bishop); *Rock 3593* (cotypes, Bishop; Gray); *Rock 12968,* Puuwaawaa, August, 1917 (Bishop); *Carl Skottsberg 667,* same locality, September 26, 1922 (Bishop).

In addition to the specimens listed may be mentioned two more: *Forbes 874-H,* Omaokoili, Hawaii, June 17, 1915 (Field); *Rock,* Puuwaawaa, Hawaii, August, 1917 (Bishop). These have smaller leaves, as in the species proper, but the capitula are exceedingly numerous. The involucres are mostly of the yellowish-tomentose, brownish- or yellowish-glanded type found in various forms of *E. Celastroides* and in *E. multiformis* var. *manoana.* The Forbes plant has numerous capsules. These, even though ±3.2 mm. tall, are sterile, giving evidence of hybridity.

8. Euphorbia atrococca Heller, Minn. Bot. Studs. **1**: 844, *pl. 50.* 1897.

Chamaesyce atrococca (Heller) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Leaves numerous, 5–13 mm. wide, dull green.
b. Leaf-blade subcoriaceous, 2–4 cm. long, the lateral veins obscure..*E. atrococca*
b. Leaf-blade thinner, 3–5.3 cm. long, the lateral veins manifest.....
.....var. γ. *kilaueana*
a. Leaves fewer, the larger ones 1.2–1.8 cm. wide, darker green....var. β. *kokeeana*

Small tree, about 3 m. tall, with brownish bark, freely branching above; secondary branches numerous, with moderately long (often 1–3 cm.) internodes; glabrous ultimate and subultimate branchlets nodose, slender, suggestive of *E. multiformis,* their internodes mostly 0.5–1.5 cm. long. Leaves numerous but not crowded, opposite, the slender petiole glabrous and 3–4 mm. long; blade narrowly to moderately oblong-oblanceolate, at the obtuse to rounded or subtruncate apex sometimes most minutely retuse, at base more often almost or fully equilateral, at margin entire, dull green, subcoriaceous, 2–4 cm. long and 5–13 mm. wide, midvein prominent especially beneath, lateral veins obscure; stipular body broadly triangular, slightly fringed, ±1 mm. tall. Capitula mostly 3–5 in axillary and terminal clusters (these terminating now glabrous sulcate short peduncles now much abbreviated minutely leaved branchlets). Involucre subsessile, campanulate, outwardly glabrate except on lobes, about 2.2 mm. tall; glands 4, transversely oblong, exappendiculate, well separated; stamens exserted. Capsule (submature) oblong-orbicular in side-view, blackish, about 3 mm. tall, commonly erect; cocci carinate, somewhat concave (but not sulcate) on each side of keel, irregularly appressed-hispid with whitish arcuate hairs; styles connate below, bifurcate nearly half-way, the branches apically thickened; stipe glabrate, ±1 mm. long. Seeds said to be "pitted and rugose."

Type: Collected by *Amos Arthur Heller,* no. *2500,* on the ridge west of the Hanapepe River, Kauai, July 4, 1895 (Minnesota).

Distribution: Known only from type locality in southern Kauai.

Specimens examined: *Heller 2500* (cotypes, Field; Gray; New York); *Heller* (similarly) *2500,* on the Hanapepe and Wahiawa Watershed, southern Kauai, July 4, 1895 (Kew); *Heller* (similarly) *2500,* on the ridge west of the Hanapepe River, Kauai, same date (Paris); *Heller* (similarly) *2500,* same locality, July 11, 1895 (Cornell; Field; Gray); *Heller* (similarly) *2500,* same locality, July 17, 1895 (Field); *Heller* (similarly) *2500,* same locality, August 6, 1895 (Field); *Heller* (similarly) *2500,* same locality, August 22, 1895 (Missouri).

Heller describes the seeds as "pitted and rugose" but an examination of some twenty or more of the numerous apparently

full-sized capsules on his various specimens fails to show even one seed. Uniformly the carpels have only tiny white shriveled abortive ovules (although these indeed are, under a high magnification, more or less "pitted and rugose"). Despite the acceptance, apparently without exception, of this species by various botanists who have collected it (or its var. *kokeeana)* in the field (Heller, Rock, Forbes, and Skottsberg), a genetic study of its status with reference to a possibly hybrid origin is much to be desired. (See remark under var. *kokeeana.)*

Euphorbia atrococca var. β. **kokeeana** Sherff, Bot. Gaz. **97:** 603. 1936.

Leaves fewer, broader (the larger ones mostly 1.2–1.8 cm. wide), darker green, the lateral veins evident.

Type: Collected by *Dr. Carl Skottsberg,* no. *1017,* between Kokee and Mohihi, Kauai, October 29, 1922 (Bishop).

Distribution: Southwestern Kauai.

Specimens examined: *Otto Degener 8094,* Waimea Canyon near Kokee Camp, Kauai, June 30, 1926 (Degener, 2 sheets; Field, 2 sheets; New York); *Charles N. Forbes 435-K,* Kaholuamanu, behind Waimea, Kauai, September, 1909 (Field, 2 sheets); *Amos Arthur Heller 2858,* on Kaholuamanu, above Waimea, September 10–16, 1895 (Bishop); *Heller* (similarly) *2858,* same locality, October 1–8, 1895 (Cornell; Gray; Kew; Missouri; New York; Paris; U. S.); *Joseph F. Rock,* Kaholuamanu, Kauai, October, 1911 (Field); *Rock 10099,* below F. Gray's mountain house, Kaholuamanu, same date (Bishop; Gray); *Rock 12933,* Kaholuamanu, same date (Bishop).

On most specimens the apparently mature capsules are, as in the species proper, devoid of good seeds. On two of the cited *Degener* specimens, however, a few ripe seeds were found. These were ovate-oblong in outline, truncate at base, obtuse at apex, acutely tetragonal with prominently carinate angles, reddish-brown to brownish-black, transversely scrobiculate, 1.8–2 mm. long.

Heller (Minn. Bot. Studs. **1:** 844. 1897) described this as "a well marked form, growing at an elevation of 4000 feet, near the edge of the woods."

Euphorbia atrococca var. γ. **kilaueana** Sherff, Bot. Gaz. **97:** 604. 1936.

Differing from the species proper in its more erect (or at least more antrorsely directed) and more elongate branches, also its thinner leaves (which latter are beautifully spatulate-oblanceolate, apically more often somewhat acute, the blade 3–5.3 cm. long). Inflorescence unknown.

Type: Collected by *Abbé Urbain Faurie,* no. *470,* Kilauea, Kauai, January, 1910 (British).

Distribution: Known only from type locality in northeasternmost Kauai.

Specimens examined: *Faurie 470* (type, British: cotype, Paris; cotype fragment, Bishop).

9. Euphorbia multiformis Hooker & Arnott, Bot. Beechey's Voy., p. 95. 1832.

Anisophyllum multiforme Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 37. 1860.

Chamaesyce multiformis (Hook. & Arn.) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Branchlets pubescent.
  b. Branchlets, involucres, and pedicels densely tomentulose.
    c. Rameal internodes often only 3–6 mm. long; leaf-blades mostly less than 2 cm. long, their veins very obsolete; capitula clustered in groups of 2–5; stamens exceedingly numerous.....var. *θ. kaalana*
    c. Rameal internodes more elongate; leaf-blades mostly 2–3 cm. long, their veins conspicuous underneath; capitula singly disposed; stamens fewer.....var. *η. tomentella*
  b. Branchlets spreading-hispidulous.
    c. Leaves mostly under 2 cm. long.
      d. Ultimate branchlets capilliform; leaves very thin; plant of East Maui .....var. *γ. haleakalana*
      d. Ultimate branchlets thicker; leaves moderately thin; plant of Oahu .....var. *ι. perdita*
    c. Leaves mostly over 2 cm. long and moderately thin; plant of Oahu, Lanai, and western Hawaii.....var. *ε. manoana*
a. Branchlets glabrous or essentially so.
  b. Dwarf shrub up to 6 dm. tall; capitula few, solitary in upper axils; bog plant of southern Kauai.....var. *ζ. sparsiflora*
  b. Shrub or tree, capitula few or numerous.
    c. Capsular stipe glabrous.....*E. multiformis*
    c. Capsular stipe hispid.
      d. Involucre outwardly glabrous or only slightly pubescent at top.
        e. Ultimate branchlets capilliform or nearly so.....var. *δ. kapuleiensis*

e. Ultimate branchlets slender but hardly subcapilliform.....
.....var. *β. microphylla*
d. Involucre outwardly hirtous, densely tomentose at top....var. *ε. manoana*

A glabrous shrub with slender and even extremely nodose (and often very decompound) branches (ultimate ones 1–1.5 mm. thick for most of their length); internodes of a main branch up to 3.2 cm., of branchlets mostly under 2 cm. long. Leaves opposite, the slender petiole glabrous or obsoletely hispidulous and 1–3 mm. long; blade narrow-oblong or -lanceolate or -oblanceolate, at apex subobtuse, obtuse, or rounded to narrowly truncate and rarely subretuse, entire, moderately and more or less gradually narrowed below to a usually equilateral base, at margin not or scarcely revolute, membranous, obscurely veined above, pale and manifestly veined underneath, 2–3.5 cm. long and 0.9–1.4 cm. wide; stipular body very low (±1 mm. tall), rounded. Capitula solitary, terminal and axillary. Involucre campanulate, outwardly glabrous or (especially above) slightly puberulous, 1.5–1.7 mm. tall; glands 4, broader than tall, transversely oblong to oblong-orbiculate, contiguous or nearly so, exappendiculate; lobes ovate or triangular-ovate and at apex somewhat lacerate-hirsute; pedicel only about 1–2 mm. long. Staminophores numerous, conspicuously exserted. Capsule glabrous, cernuous, short-stipitate, about 3 mm. tall and 3 mm. thick; cocci moderately carinate, brown, not sulcate; stipe glabrous; styles very short, connate at base, bifurcate half-way, the branches not thickened. Seeds ovate, tetragonal, grayish, scrobiculate, about 2 mm. long.

Type: Collected by *Lay* and *Collie* (Captain Beechey's Voyage), Oahu, 1826–27 (Kew).

Distribution: Oahu, exact part unknown; perhaps now extinct.

Specimens examined: Lay & Collie, Oahu, 1826–27 (type, Kew).

Euphorbia multiformis was published as a *nomen nudum* (or *subnudum;* a statement was indeed made regarding the variation in size from a small tree at higher altitudes to a herbaceous plant in low cultivated places) by Gaudichaud (Bot. Freycinet's Voy., p. 100. 1830). It was first effectively published

by Hooker and Arnott *(loc. cit.)*. They gave a definite description and cited Gaudichaud only interrogatively. They drew their description from two specimens by Lay and Collie. These specimens, now before me, are mounted on the same sheet and are still well preserved. They are woody-branched and very leafy. They differ at once from all other specimens of this species known to me in having many of the leaves less rounded or obtuse at the apex (although they are still subobtuse or just barely subacute) and in the entirely glabrous capsular stipe. Perhaps this form is no longer extant upon Oahu, but all other forms at present known are *varietally* quite distinct and for a proper understanding of their relationships should be so designated.

The *Gaudichaud* material, as indeed the *Eschscholtz*, the *Maximovicz* (or *Maximowitsch)*, and the *Macrae* materials cited by Boissier *(in* DC., Prodr. **15**, pt. 2: 12. 1862) for *E. multiformis*, is referable to variety *manoana*. An additional specimen (Vienna) collected by Lay and Collie on Oahu and distributed from Banks' herbarium as *Phyllanthus distichus*, likewise belongs to the variety *manoana*. Still another specimen collected by Lay and Collie and mounted on the same sheet (Kew) with the type of *E. Hookeri* belongs to the variety *microphylla*. Whether this last specimen had been so mounted prior to Hooker and Arnott's preparation of their description I cannot say, but their respective descriptions of *E. multiformis* and of the plant later named by Steudel *E. Hookeri* clearly do not pertain to it and it thus is to be excluded from our concept of *E. multiformis* proper.

Euphorbia multiformis var. β. **microphylla** Boissier *in* DC., Prodr. **15**, pt. 2: 12. 1862.

Euphorbia multiformis Gaudichaud, Bot. Freycinet's Voy., p. 100. 1830 (in part; *nomen subnudum)*.

Euphorbia multiformis var. *tenuior* A. Gray *ex* H. Mann, Proc. Amer. Acad. **7**: 202 (Enum. Haw. Pl., no. 439, var. γ.). 1867.

Euphorbia multiformis var. α. A. Gray *ex* Hillebr., Fl. Haw. Isls., p. 396. 1888.

Mainly glabrous; lateral branches or branchlets slender and usually more elongate (often almost subcapilliform), more or less herbaceous. Leaf petiole often pubescent; blade from elliptic-oblong to cuneately obovate, at apex mostly rounded and more often retuse; very diverse in size, now 2–4.5 cm. now for many branchlets down to 0.5 cm. long. Involucre outwardly glabrous or sometimes slightly pubescent at top; capsule glabrous, its stipe hispid.

Type: Collected by *Jules Remy,* no. *593,* Oahu, 1851–55 (Paris).

Distribution: Oahu and northeastern Molokai.

Specimens examined: *Frederick Debell Bennett 121,* Oahu (Berlin); *Otto Degener & Kwan Kee Park 8040,* rocky moderately wet sunny ridge, Pig God Trail, Punaluu Valley, Oahu, August 11, 1931 (Degener, 2 sheets; Field); *Degener & Kazuto Nitta 8052,* talus, in rainy region not far from ocean, Wailau Valley, Molokai, August 4, 1928 (Degener, 2 sheets; Field; New York); *Degener 8063,* rocky and partly wooded ridge, east rim of Manoa Valley, Oahu, February 28, 1928 (Degener, 2 sheets; Field; New York); *Degener 8072,* rocky region, Hauula Valley, Oahu, September 25, 1927 (Degener; Field; New York); *Degener 8079,* Oahu, February 20, 1927 (Degener; New York); *Degener 8081,* head of Manoa Valley, Oahu, January 9, 1927 (Degener, 2 sheets; Field; New York); *Degener 8082,* moderately wet open region, slope northeast of Nuuanu Valley, Oahu, November 20, 1926 (Degener, 2 sheets; New York); *Degener 8084,* along trail near hairpin turn at Nuuanu Pali, Oahu, November 20, 1926 (Degener); *Degener 8096,* open rocky moderately rainy ridge, northeast of Nuuanu Pali, Oahu, March 28, 1926 (Field; New York); *Degener, K. Park & D. L. Topping 9966,* in rainy forest near summit, Kuliouou Valley, Oahu, June 23, 1935 (Berlin; British; Degener; Delessert; Field; Gray; Kew; Leningrad; Missouri; Paris); *Degener & Park 9967,* edge of forest with *Dicranopteris,* east ridge of Kaipapau Valley, Oahu, July 7, 1935 (Berlin; Degener; Field; Paris); *Abbé Urbain Faurie 469,* Kalihi Pali, Oahu, October, 1909 (Delessert); *Charles N. Forbes,* Upper Kalihi, Oahu, April 2, 1909 (Bishop); *Forbes,* Koolauloa Mountains between Punaluu and Kaipapau, Oahu, November 14–21, 1908 (Field); *Forbes 248-Mo,* Pelekunu Trail, Molokai, July, 1912 (Field, 2 sheets; Missouri); *Forbes 545-Mo,* Wailau Valley, Molokai, September, 1912 (Bishop; Field; Missouri); *Forbes 1048-O,* ridge west of Nuuanu Valley, Oahu, January 20, 1909 (Field); *Forbes 1257-O,* Kalihi Valley, April 2, 1909 (Field, 2 sheets); *Forbes 1427-O,* west side of Nuuanu Valley, Oahu, December 17, 1909 (Field, 2 sheets; Missouri); *Forbes 1668-O,* ridges of Puu-O-Kona, Oahu, March 14, 1911 (Field); *Forbes 2009-O,* ridge east of Kouliouiki, Oahu, November 17, 1914 (Bishop; Missouri); *Charles Gaudichaud,* Hawaiian Isls. (Paris); *Gaudichaud,* Hawaiian Isls., September–October, 1836 (Paris, 2 sheets); *Amos Arthur Heller 2199,* lower slopes of Konahuanui, above Manoa, April 22, 1895 (Missouri; New York; U. S.); *Heller* (similarly) *2199,* at the Pali, Oahu, April 23, 1895 (Cornell; Field, 3 sheets; Gray; Kew; Paris); *Heller* (similarly) *2199,* same place, May 24, 1895 (Bishop; Delessert; Field); *Dr. William Hillebrand,* Oahu (Berlin);

Hillebrand, Nuuanu, Oahu (Kew); *Hillebrand 49*, Oahu (Gray; Kew); *Hillebrand & Rev. John M. Lydgate*, ridge, Hawaiian Isls., May, 1872 (Bishop; the plant may have been collected by Lydgate alone, or else in an earlier year, since Hillebrand himself is said to have left the Hawaiian Islands in 1871—*cf.* W. F. Hillebrand in Hillebr. Fl. Haw. Isls., p. xii, 1888); *Hillebrand & Lydgate, Palolo*, Oahu (Bishop); *Hinds*, Hawaiian Isls. (Kew); *Albert S. Hitchcock 13766*, grassy slope, Nuuanu Pali, Oahu, June 17, 1916 (Bishop; U. S.); *Hitchcock 14058*, same place, July 19, 1916 (U. S.); *Lay & Collie* (Capt. Beechey's Voy.), Oahu (Kew, where mixed with *Euphorbia Hookeri); H. L. Lyon 12934*, Niu Ridge, Oahu, August 29, 1909 (Bishop); *James Macrae*, Oahu, May, 1825 (Kew); *Horace Mann & William T. Brigham 101 pro parte*, Oahu, 1864–1865 (Field; Gray; Missouri; New York); *Mann & Brigham 244*, Hawaiian Isls., 1864–1865 (Bishop; Cornell); *Alfred Meebold*, alt. 2500 ft., Punaluu, Oahu, May, 1932 (Bishop); *Dr. Meyen*, Oahu (Missouri); *Thomas Nuttall*, Oahu, 1835 (Kew); *R. Onauye*, small tree about 12 ft. tall, rain forest, alt. 1700 ft., Maakua-Papali ridge, Kaipapau Forest Reserve, Hauula, Koolau Mountains, Oahu, October 15, 1933 (New York); *Remy 593* (type, Paris); *Joseph F. Rock 3038*, Niu Valley, Oahu, December, 1910 (Gray; New York); *Rock 4822*, alt. 1200 ft., same locality, August 22, 1909 (Bishop; Gray; Vienna); *Rock 17068*, Palolo-Manoa Valley, Oahu, May, 1918 (Bishop); *Rock 17327*, dry section of Waiahole, Oahu, December, 1919 (Bishop); *Rock 17328*, wet forest, along trail at Waiahole, Oahu, December, 1919 (Bishop); *Rock & O. Swezey*, Niu Valley, Oahu, December, 1910 (Field); *Harold St. John 10090*, bush 5 ft. tall, open woods, alt. 2100 ft., Kaluanui, Oahu, November 30, 1929 (Field); *Dr. Berthold Seemann 1728*, Oahu, May, 1849 (Gray; Kew); *John F. G. Stokes*, Kanapou Bay, Kahoolawe (Bishop); *United States Exploring Expedition*, Oahu, 1840 (U. S); *U. S. Explor. Exped.*, barren hills behind Honolulu, Oahu, 1840 (Gray); *Dr. Heinrich Wawra* 1754, Oahu, 1868–71 (Vienna, 2 sheets); *Wawra 2341*, Hawaiian Isls., 1868–71 (Vienna).

At times the plants are more sarmentose, the numerous additional delicate branchlets having an abundance of smaller leaves and bearing capsules down to 1.6 mm. long with seeds about 1.4 mm. long.

Euphorbia multiformis var. γ. **haleakalana** Sherff, Bot. Gaz. **97**: 591. 1936.

In habit very similar to variety *microphylla*. Branches and leaf petioles hispid. Involucre outwardly now glabrate now (especially toward summit) spreading-hispid; glands more often spreading; pedicel densely and spreadingly white-hispid. Capsule about 1.5 mm. tall, its stipe spreading-hispid.

Type: Collected by *Charles N. Forbes*, no. *2010-M*, Auwahi, southernmost East Maui, March 18, 1920 (Field).

Distribution: Known only from type locality in East Maui.

Specimens examined: *Forbes 2010-M* (type, Field).

Euphorbia multiformis var. δ. **kapuleiensis** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 591. 1936.

Similar to variety *microphylla*. Shrub about 1.8 m. tall, very delicate, branches elongate and almost pendulous; ultimate branchlets subcapilliform or capilliform; internodes commonly more elongate; leaves commonly linear-oblong or narrowly elliptic, petiole 2–3.5 mm. long, blade less than 3 cm. long.

Type: Collected by *Otto Degener*, no. *8053*, 6 ft. tall, with long almost drooping branches, rare, up ridge called Kapulei to east of white mountain Kaholoapele and back in east gully, growing on arid cliff near mango trees in east gully, Molokai, June 25, 1928 (Delessert).

Distribution: Southeastern Molokai.

Specimens examined: *Degener 8053* (type, Delessert: cotypes, Degener; Field; New York); *Degener 8056*, on arid cliffs, second eastern gulch, Wawaia, Molokai, June 27, 1928 (Degener, 3 sheets; Field); *Degener 8061*, one of the dry valleys between Kamalo and Kaunakakai, Molokai, July 29, 1928 (Degener, 2 sheets; Delessert; Field, 2 sheets).

Euphorbia multiformis var. ε. **manoana** Sherff, Bot. Gaz. **97**: 591. 1936.

Euphorbia multiformis Gaudichaud, Bot. Freycinet's Voy., p. 100. 1830 (in part; *nomen subnudum);* Boiss. *in* DC., Prodr. **15**, pt. 2: 11. 1862 (from the description and synonym of Gaudichaud [in part] and from the plants of Eschscholtz, of Maximovicz, and of Macrae; excluding syn. Hook. & Arn.).

Younger branches glabrous (as on type) or spreading-hispidulous. Leaves more often elliptic-oblong to cuneately oblanceolate, at apex mostly rounded or truncate-rounded and often retuse, sometimes hispidulous underneath and often with tomentulose petiole. Involucre outwardly papillate-hirtous below and densely tomentose at top.

Type: Collected by *Carl Johann Maximovicz (Maximowitsch)*, no. *145*, Honolulu, Oahu (Kew).

Distribution: Oahu, Lanai, and western Hawaii.

Specimens examined: *Mr. Ballieu*, Hawaiian Isls. (Paris); *Otto Degener H-213*, on Tantalus side of Manoa Valley, Oahu, February 12, 1923 (Degener, 2 sheets; Field; New York, 2 sheets); *Frederick Eschscholtz*, Oahu, 1816–17 (Delessert;

Gray; Kew); *Charles N. Forbes,* ridge west of Kalihi Valley, Oahu, August 18, 1908 (Field, 2 sheets; Missouri); *Forbes 358-H,* growing 12 ft. tall, with drooping branches, Kanehaha, Kona, Hawaii, July 25, 1911 (Bishop); *Forbes 1660-O,* Pacific Heights ridges, Oahu, March, 1911 (Field, 2 sheets); *Forbes 1838-O* and *1842-O,* Waianae Mountains, Kawaihapai, Oahu, February 14, 1913 (Field; apparently a second growth form, the larger leaves with blades up to 7.6 cm. long and 2.7 cm. wide); *Charles Gaudichaud,* Hawaiian Isls., 1819 (Berlin); *Dr. William Hillebrand,* Honolulu, Oahu (Vienna); *Lay & Collie* (Capt. Beechey's Voy.), Oahu, 1826–27 (Vienna); *James Macrae,* Oahu, May 20, 1825 (Berlin; New York; Vienna); *Maximowicz 145* (type, Kew: cotype, Berlin); *George C. Munro 69,* Maluea, Lanai, December 27, 1913 (Bishop); *Munro 80,* same locality and date (Bishop, 2 sheets); *Joseph F. Rock,* right-hand branch of Wailupe Valley, Oahu, April 14, 1918 (Bishop); *Rock 8126,* Koele, Lanai, August 3, 1910 (Field); *Carl Skottsberg 1073,* Nuuanu-Pauoa ridge, Oahu, November 5, 1922 (Bishop); *United States Exploring Expedition,* Oahu, 1840 (Missouri; U. S.); *Adelbert Von Chamisso 182,* Oahu, 1816–17 (Berlin; Leningrad).

Boissier, to whom this variety represented the species proper, described the plants as glabrous. In two of the collections cited by him (Eschscholtz's and Macrae's), however, the younger branchlets and leaf petioles and lower surfaces are more or less hispidulous; so also for some of Gaudichaud's original material, namely, Kunth's ample fragment (Berlin). The difference in pubescence seems hardly constant enough to justify attempts at further delimitation.

Perhaps hybridizes with *E. Celastroides (qu. vide)* or one of its varieties.

Euphorbia multiformis var. ζ. **sparsiflora** (Heller) Sherff, Bot. Gaz. **97**: 590. 1936.

Euphorbia sparsiflora Heller, Minn. Bot. Studs. **1**: 846, *pl. 51.* 1897.

Euphorbia palustris Heller, *loc. cit.* 847.

A glabrous shrub, 2.5–6 dm. tall, stems slender, branched, the branches ascending. Leaves oblong-oblanceolate to obovate, evenly narrowed to a cuneate base, rounded and blunt at the apex, blade 1.5–2.8 cm. long. Capitula few, solitary in the upper axils.

Type: Collected by *Amos Arthur Heller,* no. *2699,* at altitude of 3000 feet, in bog at head of the Wahiawa River, Kauai, 1895 (Minnesota).

Distribution: Southern Kauai.

Specimens examined: *Abbé Urbain Faurie 467,* Hanapepe, Kauai, December, 1909 (British; Paris); *Charles N. Forbes 206-K,* Wahiawa Swamp, Kauai, August, 1909 (Field, 2 sheets); *Heller 2699,* in and near a bog at the head of the Wahiawa River, Kauai, August 12, 1895 (Bishop, 2 sheets; Field, 2 sheets; Gray; Missouri; New York); *Heller* (similarly) *2699,* same locality, August 21, 1895 (Paris); *Heller* (similarly) *2699,* same locality, October 19, 1895 (Cornell; Field, 2 sheets); *Rev. J. M. Lydgate,* Wahiawa Mountains, Kauai (Bishop).

In herbarium specimens the stems are apt to be covered with moss and other swamp vegetation. Faurie gives merely "Hanapepe" for his locality, but the conspicuous investment of bog moss around the lower stem of one of his specimens betrays a bog habitat.

Euphorbia multiformis var. *η.* **tomentella Boissier** *in* DC., Prodr. **15,** pt. 2: 12. 1862. (Pl. 9.)

The numerous branchlets tomentulose to tomentose. Leaves resembling those of var. *manoana,* petiole 2–3 mm. long and densely tomentose; blade with conspicuous veins on lower surface (which is more or less tomentulose, especially toward petiole), up to 3.2 cm. long. Capitula singly disposed at the nodes, conspicuously tomentose, about 3 mm. across, the glabrate to sparsely pilose glands brownish-black; staminophores not numerous. Capsules not known.

Type: Collected by *Jules Remy,* no. *594,* Oahu, 1851–1855 (Paris).

Distribution: Oahu.

Specimens examined: *Remy 594* (type, Paris).

Euphorbia multiformis var. *θ.* **kaalana** Sherff, Bot. Gaz. **97:** 590. 1936.

Branchlets slender but conspicuously nodose, tomentulose, the numerous internodes often only 3–6 mm. long. Leaf petioles tomentulose, about 1–1.5 mm. long; blade more or less obovate, membranaceous, basally oblique, apically rotundate and often even retuse, silvery-tomentulose underneath, less than 2 cm. long, the veins very obsolete. Capitula rather numerous, often clustered in groups of 2–5 at the tips of very minute axillary branchlets, conspicuously tomentose, about 3 mm. wide; glands brown, more or less glabrate; anthers ex-

ceedingly numerous. Capsules minutely pilose, about 2.5 mm. tall and about 3 mm. wide. Seeds subtetragonal, scrobiculate, 1.5 mm. long.

Type: Collected by the *United States Exploring Expedition,* Waianae, western Oahu, 1840 (U. S.).

Distribution: Known only from type locality in western Oahu.

Specimens examined: *U. S. Explor. Exped.,* Waianae, Oahu, 1840 (type, U. S.: cotype fragments, Bishop; Gray; Missouri).

A transitional form which might almost as well be considered a variety of *E. Celastroides* Boissier. It was confused by Asa Gray with *E. multiformis* var. *tomentella* Boiss., a plant with leaf blades mostly 2–3 cm. long, their veins conspicuous underneath, internodes of branchlets more elongate, capitula singly disposed, stamens fewer, etc.

Euphorbia multiformis var. ι. **perdita.**

Varietas nova. Ramuli tenues suberecti, moderate nodosi internodiis saepius 8–15 mm. longis, aegre brevissimeque patenti-hispidi, saepius circ. 1 mm. crassi. Folia principalia anguste oblonga, apice truncata vel emarginata basi inaequilateralia (lamina ±1.8 cm. longa et 6.5 mm. lata, petiolo ±2 mm. longo); ramulorum parva et sub 1 cm. longa, oblongo-obovata, apice truncata vel emarginata, basi truncata vel parce subcordata, membranacea, petiolo tenui ±1 mm. longo marginibusque pubescentia aliter glabrata, venis obsoletis. Capitula numerosa, plerumque in ramulis minutis axillaribus 2–5-aggregata, albido-tomentulosa, circ. 3 mm. crassa, glandulis siccis brunneis glabratis; antheris numerosis; capsula plus minusve albo-pubescenti, subsessili; seminibus subtetragonis, scrobiculatis, circ. 1.4 mm. longis.

Branchlets slender, suberect, moderately nodose (internodes more often 8–15 mm. long), weakly and very shortly spreading-hispid, more often about 1 mm. thick. Principal leaves narrowly oblong, apically truncate or emarginate and basally oblique (blade ±1.8 cm. long and 6.5 mm. wide, petiole ±2 mm. long); leaves of the branchlets small and under 1 cm.

long, oblong-obovate, apically truncate or emarginate, basally truncate or scarcely subcordate, membranaceous, petiole (slender and ±1 mm. long) and margins pubescent but surfaces glabrate, veins obsolete. Capitula numerous, commonly 2–5-clustered on minute axillary branchlets, whitish-tomentulose, about 3 mm. thick, the glabrate glands brown when dry; anthers numerous; capsule more or less white-pubescent, subsessile; seeds subtetragonal, scrobiculate, about 1.4 mm. long.

Type: Collected by *Adelbert Von Chamisso,* island of Oahu, 1816–1817 (Field).

Distribution: Oahu.

Specimens examined: *Von Chamisso,* Oahu, 1816–1817 (Field, type).

10. Euphorbia Skottsbergii Sherff, Bot. Gaz. **97**: 588. 1936. *Chamaesyce Skottsbergii* (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Principal leaves entire or seldom very obscurely denticulate near apex; plants of southwestern Oahu.
  b. Prostrate, ultimate branchlets slender but not capilliform....*E. Skottsbergii*
  b. Erect, ultimate branchlets capilliform.....var. *β. kalaeloana*
a. Principal leaves often denticulate; plants of northwesternmost Molokai.
  b. Leaves commonly elliptic or narrowly obovate-elliptic....var. *δ. Vaccinioides*
  b. Leaves elliptic-oblong to suborbicular.....var. *γ. audens*

Prostrate shrub, ramose; branches slender (ultimate ones exceedingly so), nodose, divaricate, the youngest ones tomentulose. Leaf petioles slender, tomentulose, 1–3 mm. long; blade variously obovate-oblong, oblong-elliptic, or obovate-subrhombic, basally often obliquely cuneate-rotundate, apically obtuse or rotundate, at the scarcely subrevolute margin flat or subrepand (toward apex very rarely obsolete-denticulate), membranaceous, glabrate above, more or less hispidulous below, commonly 1–2 cm. long and 7–13 mm. wide; interpetiolar body scarcely 0.5 mm. tall. Capitula commonly disposed along very minute axillary branchlets. Involucre not truly pedicellate, minute, campanulate, glabrate or moderately hispidulous, only about 1–1.1 mm. tall; glands 4 or more rarely 5, transversely oblong, exappendiculate, remote or almost contiguous; lobes minute, erectly oblong, fimbriate; staminophores ex-

serted. Capsule minute, glabrate, only about 1.6 mm. tall, cernuous, stipitate, short-hispidulous; cocci scarcely carinate, not sulcate; styles distinct, bifurcate almost to the middle. Seeds ovate, tetragonal, basally truncate, apically obtuse, cinereous, papillate-scrobiculate, about 1.1 mm. long.

Type: Collected by *Dr. Carl Skottsberg,* no. *122,* Ewa coral flat, Oahu, August 11, 1922 (Bishop).

Distribution: Near southern coast of Oahu, from Barbers Point eastward toward Pearl Harbor.

Specimens examined: *Otto Degener 8050,* arid fossil reef, between Barbers Point and Pearl Harbor, Oahu, May 8, 1932 (Degener; Field; New York); *Charles N. Forbes 2330-O,* coral plain below Ewa and Sisal, Oahu, March 14, 1916 (Field, 4 sheets); *Skottsberg 122* (type, Bishop); *Otto H. Swezey,* Oahu (Bishop).

To be distinguished from the somewhat similar *E. multiformis* var. *kaalana,* with which it has been confused in herbaria, by its smaller and less tomentulose involucres, its much smaller capsules, etc.

Euphorbia Skottsbergii var. β. **kalaeloana** Sherff, Bot. Gaz. **97**: 589. 1936. (Pl. 10.)

Erect, more branched; ultimate branchlets more often capiliform. Leaves smaller, more often 5–9 (rarely –14) mm. long.

Type: Collected by *Joseph F. Rock,* no. *17034,* coral plain, under algaroba, back of Barbers Point, Oahu, November, 1919 (1st sheet, Gray; 2nd sheet, Bishop).

Distribution: Known only from type vicinity of Barbers Point (Kalaeloa), southern coast of Oahu.

Specimens examined: *Charles N. Forbes* (with C. Montague Cooke, Jr.) *1760-O,* near Sisal, Oahu, February 12, 1912 (Field); *Rock 17034* (1st type sheet, Gray; 2nd type sheet, Bishop).

Euphorbia Skottsbergii var. γ. **audens** Sherff, Bot. Gaz. **97**: 589. 1936.

Leaf-blade rotundate or more often oblong or elliptic-oblong, at the often emarginate apex obtuse or subtruncate, at the often oblique base narrowed or truncate or more rarely somewhat subcordate, on each edge cartilaginous and commonly (but not always) 3–10-denticulate with the sharp and indurated teeth

subspreading-antrorse; stipular body triangular (very widely so), finally often cleft, scarcely 1 mm. tall. Involucral glands commonly 5 more rarely 4, yellow (or when dry blackish-brown), commonly contiguous. Capsule sparsely pilose at base; seeds about 1.3 mm. long.

Type: Collected by *Charles N. Forbes,* no. *620-Mo,* beach near Ka Lae Ka Ilio Ilio, Molokai, March 25, 1915 (Missouri).

Distribution: Near coast, northwesternmost Molokai.

Specimens examined: *Otto Degener 8066,* on arid coastal chiefly basic rocks, near Pohahumauliuli, Molokai, April 28, 1928 (Degener, 2 sheets; New York); *Degener 8068,* arid region near the coast, near Waiakanapo, Molokai, April 19, 1928 (Degener, 2 sheets; Field; New York); *Degener 8071,* on aeolian lime deposits in arid region, near Moomomi, Molokai, April 25, 1928 (Degener, 2 sheets; Field; New York); *Forbes 620-Mo* (type, Missouri).

Euphorbia Skottsbergii var. δ. **Vaccinioides** Sherff, Bot. Gaz. **97**: 589. 1936.

Leaves commonly elliptic or narrowly obovate-elliptic, on each edge often 1–12-denticulate.

Type: Collected by *Joseph F. Rock,* no. *14072,* west end flats, Molokai, April, 1918 (Bishop).

Distribution: Western Molokai.

Specimens examined: *Otto Degener 8065,* on small limestone *kipuka* in sand dunes southeast of Moomomi, Molokai, April 29, 1928 (Degener); *Joseph F. Rock 14029, Hawaiian Isls.* (Bishop); *Rock 14072* (type, Bishop).

11. Euphorbia Hillebrandii Léveillé *in* Fedde, Repert. **10**: 151. 1911.

Chamaesyce Hillebrandii (Lévl.) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Capitula usually solitary or subsolitary.
  b. Larger leaves commonly 4–6 cm. long and 1.5–2 (or even to 3.3) cm. wide .....*E. Hillebrandii*
  b. Larger leaves commonly under 4 cm. long and under 1.5 cm. wide.....var. γ. *waimanoana*
a. Capitula in a much contracted 3–10-cephalous inflorescence.....var. β. *palikeana*

Shrub probably 1–2 m. tall, glabrous, stems moderately nodose, branches slender and somewhat herbaceous. Leaves opposite and distichous, the slender and more or less hispidulous petiole 1–4 mm. long; blade narrowly or sometimes

broadly oblong-elliptic, narrowed to rounded or rarely somewhat subcordate at the often oblique base, more or less gradually narrowed above middle to a subacute or acute (or more rarely subacuminate) apex, very entire, slightly revolute, 2–6 cm. long and 1.2–2 (rarely –3.3) cm. wide; stipular body a mere ridge 1–1.5 mm. tall. Inflorescence much as in *E. Hookeri* var. *integrifolia,* the capitula usually solitary (very rarely 3–5). Capsule trigonous, glabrous, about 2.2 mm. tall but nearly 3 mm. thick; cocci moderately carinate, not sulcate; stipe now glabrous or glabrate now pubescent; styles connate at base, bifurcate half-way into apically somewhat thickened branches. Seeds much as in *E. Hookeri,* about 1.1 mm. long.

Type: Collected by *Abbé Urbain Faurie,* no. *468,* Kaala, Oahu, December, 1909 (herbarium not cited but perhaps Paris).

Distribution: Northern and central Oahu; northwesternmost Maui.

Specimens examined: *Anon. 160,* shrub about 4 ft. tall, alt. 2500–3000 ft., east side trail, Puu Kaala, Oahu, July 22, 1928 (Field); *H. F. Bergman,* alt. 1700 ft., moist woods, east side of ridge on trail to Puu Kaala, Oahu, February 11, 1928 (Bishop; Field); *J. C. Bridwell,* Puu Kaala, Oahu, January, 1920 (Bishop); *Edwin H. Bryan, Jr., Amy Suehiro & M. Fukuda,* alt. 1200–1400 ft., zone 2, south ridge of Kipapa Gulch, Waipio, Koolau Mountains, Oahu, May 15, 1932 (Bishop); *Otto Degener 8048,* moderately dry open woods, below Palikea on Honolulu side, Oahu, October 23, 1932 (Degener; Field; New York); *Degener 8080,* dry shaded ridge, near Mauna Kapu, Waianae Mts., Oahu, January 15, 1927 (Degener, 2 sheets; Field; New York); *Degener & Kwan Kee Park 8044,* becoming 5 ft. tall, open forest, Kanehoa, Oahu, July 5, 1931 (Degener; Field; New York); *Degener, Park & Y. Nitta 8046,* in woods, Pupukea-Kahuku region, Oahu, May 28, 1932 (Degener; Field; New York); *Degener, Park & Nitta 8047,* same locality and date (Degener; New York); *Degener, Park, Potter, Bush & Topping 9963,* at edge of forest, Waimano, Oahu, June 9, 1935 (Berlin; Degener; Delessert; Field; Gray; Kew; Missouri; New York; Paris; Vienna); *Degener, Park, Potter, Bush & Topping 9975,* open rainy woods, Malaekahana Trail, Laie, Oahu, July 29, 1935 (Degener; Field; Kew; Paris; Vienna); *Degener, Park, Shigeura & Takamoto 10114,* sunny exposed ridge, between Palehua and Palikea, Oahu, December 16, 1935 (Berlin; British; Cornell; Degener; Delessert; Field; Gray; Kew; Missouri; New York; Paris; Philadelphia; U. S.; Vienna); *Degener & C. L. Shear 8059,* on *Dicranopteris*-covered partly wooded ridge, Waipio-Waiawa Ridge, Oahu, March 5, 1928 (Degener; Field, 2 sheets; New York); *Faurie 468* (cotypes, British; Paris); *Charles N. Forbes,* Koolauloa Mountains between Punaluu and Kaipapau, Oahu, December 14–21, 1908 (Bishop); *Forbes,* Makaha Valley, "Kaala Moun-

tains'' (Waianae Mountains), Oahu, February 12–19, 1909 (Bishop); *Forbes 352-M*, Honokohau Drainage Basin, Maui, September 25–October 17, 1917 (Bishop); *Forbes 1159-O*, ''Kaala Mountains'' (Waianae Mountains), February 12–19, 1909 (Field; Missouri); *Forbes 1679-O*, Palehua, Waianae Mountains, Oahu, April 1–4, 1911 (Field, 2 sheets; Missouri); *Forbes 1770-O pro parte*, Mokuleia, slopes of Puu Kaala, Oahu, April 26–May 16, 1912 (Field); *Forbes 2042-O*, ridge north of Waimea Valley, Oahu, February 10–13, 1915 (Bishop); *Forbes 2104-O*, Kawailoa, Oahu, March 2–5, 1915 (Bishop; Missouri); *Dr. William Hillebrand*, Waiawa, Oahu (Bishop); *E. P. Hume 81*, alt. 400 m., valley bottom, Kipapa, Oahu, February 15, 1931 (Bishop); *R. Lyman*, damp forest, south ridge, Kipapa Gulch, Koolau Mountains, Oahu, November 10, 1929 (Bishop); *A. Meebold*, alt. 1500 ft., Pupukea, Oahu, May, 1932 (Bishop); *Joseph F. Rock 17030*, Mokuleia-Makaleha, Oahu, April, 1918 (Bishop); *Carl Skottsberg 220*, ditch trail, Oahu, August 15, 1922 (Bishop); *Skottsberg 269*, Palehua, Waianae, Oahu, August 23, 1922 (Bishop); *Skottsberg 366-b*, north slope of Puu Kaala, Waianae, Oahu, August 30, 1922 (Gothenburg).

Apparently hybridizes with varieties of *E. Celastroides (qu. vide)*.

Euphorbia Hillebrandii var. β. **palikeana** Degener & Sherff *ex* Sherff, Bot. Gaz. **97:** 581. 1936.

Inflorescence 3–10-cephalous, much contracted, 0.5–1.5 cm. long, the bracteolate nodules numerous and conspicuous.

Type: Collected by *Otto Degener, Kwan Kee Park, and William Bush,* no. *8049,* open woods, in third small valley northeast of Palikea, Oahu, September 19, 1932 (N. Y.).

Distribution: Known only from type locality in southwestern Oahu.

Specimens examined: *Degener, Park & Bush 8049* (type, New York: cotype, Degener); *McDaniels (Dr. Carl Skottsberg* distrib. no.) *2091,* Wahiawa-Waipio ridge, Koolau, Oahu, October 6, 1922 (Gothenburg).

Perhaps a mere state of the species proper.

Euphorbia Hillebrandii var. γ. **waimanoana** Sherff, Bot. Gaz. **97:** 581. 1936.

Chamaesyce Hillebrandii var. *waimanoana* (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Branches ascending, virgate, sulculate, glabrous, moderately nodose, internodes more often 1.3–3 cm. long. Leaf petioles slender, spreading-hispidulous, 1–2 mm. long; blades elliptic-lanceolate or (often subrhomboidally) oblanceolate-oblong, at

apex subacute or acute and almost mucronate, at base oblique and narrowed or subtruncate, glabrous, membranaceous, at margin scarcely subrevolute, somewhat paler underneath, 2–4 cm. long and 7–15 mm. wide; interpetiolar bodies widely triangular, ±0.5 mm. tall. Capitula axillary and terminal (sometimes upon minute subcapilliform axillary branchlets), solitary or subsolitary. Involucre campanulate, minute (under 1.5 mm. tall), outwardly glabrate; lobes hirtous; glands 5, transversely oblong, more or less contiguous, exappendiculate; stamens exserted; pedicel glabrous, less than 1 mm. long. Capsule (submature) glabrous, scarcely 2 mm. tall, cocci moderately carinate and esulculate; stipe glabrous, ±4 mm. long; styles distinct, bifurcate almost to the middle; seeds not seen.

Type: Collected by *Charles N. Forbes* (with *Dean Lake),* no. *1978-O,* Waimano Ridge, Oahu, October 27–30, 1914 (Bishop).

Specimens examined: *Forbes 1978-O* (type, Bishop).

Perhaps to be regarded as specifically distinct, therefore described rather fully here. The varietal name was unfortunately misspelled in the original description, to read *wainianа.*

12. Euphorbia Hookeri Steudel, Nomencl. ed. 2, **1**: 612. 1840; Boissier, Icon. Euphorb., *tab. 3.* 1866.

Euphorbia myrtifolia Hook. & Arn., Bot. Beechey's Voy., p. 95. 1832 (not L.).

Anisophyllum virgatum Klotzsch & Garcke *in* Klotzsch, Linn. natürl. Pflanzenkl. Tricoccae Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 36. 1860.

Euphorbia coriariaefolia Boiss. *in* DC., Prodr. **15**, pt. 2: 12. 1862.

Euphorbia Arnottiana Endlich., Fl. Suds. no. 1564, *fide* Drake del Castillo, Illustr. Fl. Ins. Mar. Pacif., p. 285. 1892.

Chamaesyce Hookeri J. C. Arthur, Torreya **22**: 30. 1922.

Leaves more or less repand-denticulate; styles distinct to base.....*E. Hookeri*
Leaves hardly repand, entire; styles connate at base.....var. *β. integrifolia*

Shrub 0.9 rarely up to 1.8 m. tall, glabrous, pale throughout, cauline nodes conspicuous; branches slender, subherbaceous, flexuous, weakly nodose, internodes more often 2–4 cm. long. Leaves opposite and distichous, petiole obsoletely hispidulous and about 2–4 mm. long; blade ovate or rarely subrotund, at apex acute or more rarely subobtuse, at base cuneate rotundate or subcordate often oblique, at margin more or less repand-denticulate, membranaceous, appearing polished beneath, 2–5 cm. long and 1.5–3 cm. wide, lateral veins inconspicuous; stipular body a low margin-like ridge. Capitula axillary and terminal, single on pedicels about 1–2 mm. long or several in simple or compound cymes (these commonly 1 to a node and arising alternately on each side of stem, often 2–5 cm. long); cyme branches multibracteate with pairs of minute rounded scarious bractlets but bearing only 1–3 capitula at their ends. Involucre minute, turbinate, outwardly glabrous, bearded at the throat, 1–2 mm. tall; glands 4 or even 5, transversely ovate; lobes triangular-ovate, truncate; staminophores more often not exserted. Capsule exserted, cernuous, finally glabrous, 2.2–2.8 mm. tall, cocci slightly carinate; styles distinct to base, their short branches thickened. Seeds ovate- tetragonal, gray-ish to brownish-red, 1.2–1.5 mm. long, scrobiculate with reticulate ridges and variously shaped but somewhat more often transverse pits.

Type: Collected by *Lay and Collie* (on Captain Beechey's Voyage), Oahu, 1826–27 (Kew).

Distribution: Southeastern Oahu.

Specimens examined: *Otto Degener 8101*, common on open wooded slope, middle ridge of Niu Valley, Oahu, June 4, 1932 (Degener, 4 sheets; Field; New York); *Charles N. Forbes 1578-O*, Wailupe Valley, Oahu, April 12, 1910 (Field; Missouri); *Forbes* (with *J. C. Bridwell) 2463-O*, same locality, April 11, 1917 (Bishop); *Forbes 2503-O*, same locality, May 4, 1917 (Field); *Forbes 2528-O*, Wailupe, Oahu, January, 1919 (Bishop; Field); *Charles Gaudichaud*, Hawaiian Isls., October, 1836 (Berlin, labeled *Anisophyllum virgatum* by Klotzsch & Garcke and evidently their type); *Gaudichaud 287*, same locality, September–October, 1836 (Paris); *Dr. William Hillebrand*, Nuuanu, Oahu (Kew); *Hillebrand*, Niu, Oahu, 1867 (Berlin); *Hillebrand 50*, low shrub, Oahu (Kew); *Hinds*, Oahu (Kew); *Lay & Collie* (Capt. Beechey's Voyage), Oahu, 1826–27 (type, Kew); *Horace Mann*, Hawaiian Isls. (Berlin); *Mann & William T. Brigham*, Hawaiian Isls., 1864–1865 (Cornell); *Mann & Brigham 103*, ridge east of Manoa, Oahu, October, 1865 (Bishop; Cornell; Gray;

Missouri); *Adelbert von Chamisso,* Oahu, 1816–17 (Berlin, where labeled *Anisophyllum virgatum* by Klotzsch & Garcke; Leningrad, 3 sheets).

Euphorbia Hookeri var. β. **integrifolia** Hillebrand, Fl. Haw. Isls., p. 397. 1888.

Leaves hardly repand, entire. Capitula singly disposed or few in short cymes (1–3.5 cm. long). Styles connate at base.

Type: Collected by *Dr. William Hillebrand,* western Maui (Berlin).

Distribution: Western Maui (Hillebrand cites also Lanai).

Specimens examined: *Otto Degener 8073,* dry mountain near Waihee, west Maui, July 2, 1927 (Degener, 2 sheets; New York); *Hillebrand,* west Maui (type, Berlin); *Hillebrand,* same locality (Kew); *Hillebrand,* Kanapali, west Maui (Gray).

13. Euphorbia festiva Sherff, Bot. Gaz. **97**: 589. 1936.

Chamaesyce festiva (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Shrub; branches glabrous, sulcate, nodose, the internodes 1–1.4 cm. long and 1–2 mm. thick; branchlets suberect, angulate, sulculate, sparsely hispidulous above, their internodes commonly 0.5–1 cm. long and 0.5–1 mm. thick, nodes twice as thick as internodes. Leaves opposite and distichous, the slender petiole glabrate and only about 1 mm. long; blade oblong or more rarely ovate-oblong, at apex often very minutely emarginate and obtuse or subrotund, at the oblique base nicely and broadly subcordate or even moderately cordate, on each margin very narrowly indurated and not truly revolute but commonly very obsoletely 1–8-denticulate, membranous, on both surfaces glabrous, paler underneath, 7–16 mm. long and 5–11 mm. wide; stipular body triangular, pubescent, under 1 mm. tall. Capitula terminal (at least so far as observed on 8 flowering branchlets found), solitary; involucre subsessile, campanulate, outwardly glabrate or supernally hispidulous, about 1.8–2.1 mm. tall; glands commonly 5, transversely oblong, not or obsoletely appendiculate, more or less contiguous; lobes hirtous; stamens exserted. Capsule (mature) not known; styles connate at base, strongly bifurcate, branches thickened.—Description drawn from the single type branch, which is less than 1.7 dm. long.

Type: Collected by *Thomas Nuttall,* Oahu, 1835 (Kew).
Distribution: Present, at least a century ago, on Oahu.

Specimens examined: *Nuttall,* Oahu, 1835 (type, Kew).

Nuttall had designated the type as a new species, but later Edmond Boissier determined it as *Euphorbia multiformis* H. & A. The oblong basally wide-cordate or -subcordate leaves, with their obsolete yet definitely visible teeth, easily distinguish Nuttall's plant, however, from that species. In the vast assortment of specimens of Hawaiian *Euphorbiae* studied by me from the principal European and American herbaria, no others have been found to belong here, and it may well be that during the century since Nuttall collected on Oahu the species has become extinct. (An inaccuracy in my original description [*loc. cit.*] of the branchlets, making the length of their internodes apply erroneously to the branchlets themselves, has been corrected above.)

14. Euphorbia Degeneri Sherff, Bot. Gaz. **97**: 583. 1936.
Euphorbia cordata Meyen, Beiträge Bot. Reise Erde **2**: 150. 1843 (not Schrank, Baier. Fl. **1**: 747. 1789; nor Räuschel, Nomencl. Bot. edit. III, p. 140. 1797); Boiss. Icon. Euphorb., *tab. 4.* 1866 (where leaves are erroneously shown as decussate instead of distichous).
Anisophyllum cordatum Klotzsch & Garcke, *ex* Kotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 38. 1860.
Chamaesyce Degeneri (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Leaves finally glabrate unless toward base.....*E. Degeneri*
Leaves densely pilose.....var. *β. molokaiensis*

Low prostrate undershrub, 3–6 dm. tall; branches thickish, nodose, often tortuous, tomentose, with short to very short internodes. Leaves distichous, subsessile or virtually sessile, orbicular, entire or sometimes very obscurely crenulate, cordate at base, often emarginate at apex, subfleshy, inconspicuously nerved, glabrous or glabrate or toward base slightly hispidulous, mostly 1–2 cm. wide, often finally turning reddish;

stipules low, obtuse, hairy-fringed. Capitula terminal and in upper axils, solitary or more rarely in groups of 3. Involucre subsessile, campanulate-hemispherical, mostly less than 2 mm. long, outwardly glabrous; glands substipitate, somewhat concave, transversely oblong and often bordered with a narrow membranous appendage; lobes ovate, hispid; staminophores exserted, their bractlets deeply slit. Capsule exserted, inclined, ovate, finally glabrate, about 2 mm. long; cocci slightly carinate, inconspicuously salient-punctulate; styles distinct, bifid and at tips of branches somewhat thickened. Seeds oblong, tetragonal, truncate at base, obtuse at apex, white, scrobiculate, ±1.7 mm. long.

Type specimen: Collected by *Dr. Francis Julius Ferdinand Meyen,* no. *62,* "Diamond Hill" (Diamond Head), Oahu, 1831 (Berlin).

Distribution: Along coast, Oahu and northwesternmost Molokai; also at widely scattered spots along coast of Kauai, West Maui, and Hawaii.

Specimens examined: *E. Christophersen 1398,* alt. ±5 meters, in sand, Kaena Point, Oahu, December 14, 1930 (Field, 2 sheets); *Dr. C. Montague Cooke, Jr.,* Laniloa, Oahu, February 1, 1919 (Bishop); *Otto Degener H-220,* coastal sand dune, Waimanalo, Oahu, April 8, 1923 (New York); *Degener 8067 pro parte,* along beach in arid region, near Waiakanapo, Molokai, April 19, 1928 (Degener); *Degener 8068,* arid region near coast, same locality and date (Field); *Degener 8097,* Koko Head, Oahu, October 25, 1926 (Degener); *Degener 8099,* along shore, Niulii, Kohala, Hawaii, March 23, 1930 (Degener; New York); *Degener* (similarly) *8099,* coastal dune, Waimanalo, Oahu, April 8, 1923 (Degener, 2 sheets); *Abbé Urbain Faurie 461,* on shores, Halawa, Hawaii, June, 1909 (Bishop; Delessert; Paris); *Faurie 463,* on shore at Hanapepe, Kauai, December, 1909 (Paris); *Charles N. Forbes,* beach between Diamond Head and Koko Head, Oahu, December 4, 1908 (Field; Missouri); *Forbes* (with *John F. G. Stokes) 316-M,* West Maui, February, 1913 (Bishop); *Forbes 612-Mo,* Moomomi, northwestern Molokai, March 24, 1912 (Bishop); *Forbes 1066-O,* Diamond Head, Oahu, January 26, 1909 (Field); *Forbes 1078-O pro parte,* same locality and date (Field); *Forbes 1649-O,* Kaena Point, Oahu, February 25, 1911 (Field); *Charles Gaudichaud,* Hawaiian Isls., October, 1836 (Delessert; Missouri); *Gaudichaud 286,* same locality, September–October, 1836 (Paris); *Amos Arthur Heller 2019,* Diamond Head, Oahu, March 28, 1895 (Bishop; Cornell; Field, 2 sheets; Gray; Kew; Missouri; New York; Paris; U. S.); *Dr. William Hillebrand,* Honolulu, Oahu (Vienna); *Hillebrand,* Diamond Head, Oahu (Berlin); *Hillebrand,* Kailua, Oahu, 1867 (Berlin); *Hillebrand 47,* Oahu (Kew); *Hillebrand 47-b,* Diamond Head, Oahu (Kew); *Dr. Albert S. Hitchcock 13883,* sand dune near coast, Kahuku, Oahu, June 26, 1916 (U. S.); *Rev. J. M.*

Lydgate, Mahaulepu, Kauai (Bishop); *Vaughan MacCaughey,* Waimanalo, Oahu (Bishop); *MacCaughey 12923,* Koko Head, Oahu (Bishop); *Horace Mann & William T. Brigham 106,* outer slope of Leahi, Oahu (Bishop; Cornell; Field, 3 sheets; Gray; Missouri; New York; U. S.); *Maximowicz,* Oahu (Kew); *Dr. Meyen,* Oahu, 1831 (type, Berlin: cotype, Vienna); *George C. Munro 531,* Moomomi sand hills, northwestern Molokai, July 26, 1922 (Bishop); *Marie C. Neal,* on beach, Kawailoa, Oahu, July 14, 1929 (Bishop); *Jules Remy 589,* Oahu, 1851–1855 (Field; Paris); *Joseph F. Rock,* Moomomi beach, northwestern Molokai, March, 1910 (New York); *Rock 7078 pro parte,* same locality and date (Bishop; Field; Gray; New York); *Rock 10100,* Waialua beach, Oahu, May, 1911 (Field; Gray); *Harold St. John 9983,* Kaena, beach 2 miles west of Kawaihapai, Oahu, November 3, 1929 (New York); *John F. G. Stokes,* Molokai, 1909 (Bishop); *D. LeRoy Topping 3294,* Kawela Bay, Oahu, October 9, 1926 (Degener); *United States Exploring Expedition,* Diamond Head, Oahu, 1840 (Gray; Missouri; U. S.); *Dr. Heinrich Wawra 2344,* Hawaiian Isls., 1868–1871 (Vienna); *Gerrit Parmile Wilder 87,* sandy seacoast, Kailua, Oahu, April 7, 1924 (Bishop).

Euphorbia Degeneri var. β. **molokaiensis** Sherff, Bot. Gaz. **97**: 583. 1936. (Pl. 11.)

Leaves and capsules velvety-pilose.

Type: Collected by *Joseph F. Rock,* no. *7078 pro parte,* Moomomi, Molokai, March, 1910 (Gray).

Distribution: Near coast, northwestern Molokai.

Specimens examined: *Otto Degener 8067 pro parte,* along beach in arid region, near Waiakanapo, Molokai, April 19, 1928 (Degener; Field, 2 sheets); *Rock 7078 pro parte* (type, Gray: cotype, Vienna; cotype fragment, Field).

15. Euphorbia hirta L., Sp. Pl., p. 454. 1753.

Euphorbia pilulifera of many authors, not of the Linnean Herbarium *(fide* N. E. Brown) nor of the Linnean description (for various additional synonyms and critical notes pertaining to the Linnean concept, see N. E. Brown *in* Thiselton-Dyer, Fl. Trop. Afr. **6**, pt. 1: 496. 1911; but *cf.* Farwell, Rhodora **38**: 332. 1936).

Annual herb, 1–4 dm. tall; stems erect or decumbent at base, simple or dichotomously branched, long-pilose (hairs spreading, yellowish, several-celled, attenuate, upper ones subnumerous, lower ones remote or almost lacking) and in addition more or less pubescent (with diminutive hairs, these arcuate and subappressed). Leaves opposite, petiole 1–3 mm. long; blade obliquely lanceolate or ovate or rhomboid-oblong, at apex acute or subobtuse, at base rounded on one side and cuneate on the

other, at margin serrulate, membranaceous, on both surfaces sparsely (or underneath scarcely) appressed-hispid (hairs on upper surface longer), 1–4 (more rarely –5) cm. long and 0.5–2 cm. wide; stipules separate, minute, subulate. Cymes axillary, pedunculate, 6–13 mm. in diameter, globose or divided into 2 or 3 subglobose heads; peduncle minutely pubescent (hairs arcuate, whitish, subappressed), 2–12 mm. long. Capitula numerous. Involucre staminate or hermaphroditic, minute (about 0.7 mm. tall), obconic or suburceolate, on outer surface sparsely or subdensely (more or less appressed-) hispid; glands 4 (the 5th replaced by a sinus through which passes the recurved stipe of the fruiting capsule), erect, a little longer than the lobes, linear when viewed sidewise, orbicular or oblong-orbicular (when viewed from above) at the truncate apex, bearing a minute rounded dorsal appendage just below the apex; lobes 5, deltoid, acute, hairy-fringed (seemingly fimbriate). Capsule globose-trigonous, sparsely or densely appressed-hispid, less than 0.8 mm. tall; cocci definitely carinate; styles short, deeply bifurcate into slender branches, these truncate and somewhat thickened at apex. Seeds oblong, tetragonal, reddish, at base subtruncate at apex obtuse, about 0.65–0.75 mm. long, the faces transversely somewhat rugulose.

Type: Probably from British East India (*cf.* Linnaeus, *loc. cit.*). It is still extant (Linnaeus; *cf.* N. E. Brown, *loc. cit.*, p. 497).

Distribution: A widely spread weed occurring throughout the tropics and found also in some subtropical regions; now common on all or most of the Hawaiian Islands.

Specimens examined: *Frederick Debell Bennett 64,* Oahu, 1833–36 (Berlin); *Edward L. Caum 13,* Lehua (an islet near Niihau), April 18–20, 1931 (Bishop); *D. R. Chisholm,* Midway Isl., December, 1931 (Bishop); *Otto Degener 9112,* weed in dry locality, University of Hawaii Campus, Honolulu, Oahu, November, 1926 (New York); *"Mr. Deell,"* Byron's Bay (i. e., Hilo Bay), Hawaii (Paris); *Rev. John Diell 100,* Oahu (Kew); *Abbé Urbain Faurie 516,* in herb-grown places, Halawa, Hawaii, June, 1909 (Paris); *Charles N. Forbes,* Museum Grounds, Honolulu, Oahu, July 15, 1908 (Bishop); *Forbes,* Honolulu, same date (Missouri); *Forbes,* slopes of Puu Kaala, Mokuleia, Oahu, April 26–May 16, 1912 (Field); *Forbes 7-H,* Puuwaawaa, Hawaii, June 8–14, 1911 (Bishop); *Forbes 471-K,* roadsides, Lihue, Kauai, October 4, 1916 (Bishop); *Forbes 1022-O,* Museum grounds, Honolulu, Oahu, January 15, 1909 (Bishop; Missouri); *Forbes 1075-O,* up and

around Diamond Head, Oahu, January 26, 1909 (Bishop); *D. Wesley Garber*, Old Naval Station, Honolulu, Oahu, October 16, 1919 (Bishop); *E. S. Handy*, near the landing, Niihau, August 14, 1931 (Bishop); *Amos Arthur Heller 1980*, "in and on the slopes of Makiki," Oahu, March 21, 1895 (Field; Kew; Missouri; New York; Paris; U. S.); *Heller* (similarly) *1980*, Honolulu, Oahu, March 22, 1895 (Bishop; Cornell; Field); *Heller* (similarly) *1980*, same place, March 27, 1895 (Field); *Albert S. Hitchcock 13685*, Honolulu, Oahu, June 15, 1916 (U. S.); *Hitchcock 15144*, sandy beach, West Molokai, October 12, 1916 (U. S.); *Edward P. Hume*, Kalihi Street, near Bishop Museum, Honolulu, June 10, 1931 (Bishop); *Hume 168*, alt. 30 meters, dry place at seaside, Koko Head, Oahu, January 24, 1931 (Bishop); *Lay & Collie* (Capt. Beechey's Voyage), Oahu, 1826–27 (Kew); *Horace Mann & William T. Brigham 35*, garden and roadside weed, Oahu (Bishop; Cornell; Missouri); *Charles F. Millspaugh 2587 and 2588*, Oahu, September 12, 1911 (Field); *George C. Munro 318*, Koele, Lanai, November 2, 1913 (Bishop); *Marie C. Neal*, Rabbit Island, Oahu, March 16, 1930 (Bishop); *Neal*, alt. 15–25 ft., rocky slope in gully, close to ocean, fresh-water seepage, Koko Crater, Oahu, January 18, 1931 (New York); *Jules Remy 590, Oahu*, 1851–1855 (Paris); *Remy 597*, same locality and date (Paris); *Joseph F. Rock*, Parker Ranch, Hawaii, June, 1909 (Bishop); *Rock 754*, Punaluu Railroad Station, Oahu, December 3, 1908 (Bishop); *John F. G. Stokes*, south half of Niihau, January, 1912 (Bishop).

16. Euphorbia Hypericifolia L., Sp. Pl., p. 454. 1753.

Chamaesyce Hypericifolia Millsp., Field Mus., Bot. Ser. **2:** 302. 1909.

Euphorbia bifida Hook. & Arn. *ex* St. John & Hosaka, Weeds Pineapple Fields Haw. Isls. (Univ. Haw. Res. Publ. 6), p. 105, and *plate* (p. 104). 1932 (not Hook. & Arn., Bot. Beech. Voy., p. 213. 1836). (For other synonyms and critical notes see Boiss. *in* DC., Prodr. **15,** pt. 2: 23. 1862; also N. E. Brown *in* Thiselton-Dyer, Fl. Trop. Afr., **6,** pt. 1: 498. 1911.)

Annual herb, erect, erectly branched from base or at times simple, 0.7–4.5 dm. tall; the simple or alternately branched stems glabrous or slightly pubescent. Leaves opposite, petiole slender but very short (1–2 mm.); blade variously oblong or linear-oblong to oblong-lanceolate elliptic or ovate, at apex subacute to rounded, at base oblique, marginally serrulate (the tiny teeth more or less spinulose) or rarely entire, membranaceous, glabrous or on one or both surfaces somewhat pubescent, 0.6–3.8 cm. long and 4–18 mm. wide; stipules highly variable but often partly or wholly connate into a single interpetiolar narrowly triangular erect supernally diaphanous apically

somewhat fimbriate extension ±3 mm. tall. Cymes axillary, loosely few- to many-capitulate, 0.4–1.9 cm. in diameter; peduncles glabrous or slightly puberulous, 3–18 mm. long, often with a pair of leaves at apex; bracts lanceolate, acuminate, ciliate or entirely glabrous, 1–1.5 mm. long. Involucre obconic to campanulate, glabrous or puberulous, about 1 mm. tall, shortly pedicellate; glands 4, orbicular or transversely elliptic, inconspicuous because of the large white or finally somewhat pinkish petaloid appendages (these transversely elliptic or oblong, 0.5–0.7 mm. broad, entire); lobes 5, deltoid-subulate, ciliate. Capsule depressed-globose, trigonous, glabrous or puberulous, about 1.2 mm. tall and about 1.5 mm. thick, cocci carinate; styles slender, distinct to base, deeply bifurcate. Seeds oblong-ellipsoid to oblong-ovoid, tetragonal, reddish-brown or overcast with a grayish-white or glaucescent hue, somewhat transversely rugulose, about 0.8–0.9 mm. long.

Type: Probably came from British East India (Linnaeus).

Distribution: Widely distributed throughout all warm regions. St. John and Hosaka (Weeds of the Pineapple Fields Haw. Isls., p. 105. 1932), under *their* synonymous, "*E. bifida* H. & A.," describe the occurrence for the Hawaiian Islands as follows: "found in dry and in moderately moist places. East and south Kauai: abundant; Oahu: abundant; Molokai: occasional; Lanai: common; east and west Maui: common; Hawaii: occasional."

Specimens examined: *Charles N. Forbes,* roadsides, Manoa Valley, Oahu, January, 1913 (Bishop); *Forbes 2445-O,* roadside near Niu, Oahu, April 5, 1917 (Field, 2 sheets); *Albert S. Hitchcock 13913,* weed on edge of sugar-cane field, Schofield Barracks, Oahu, June 30, 1916 (U. S.); *Hitchcock 14079,* along roadside, Manoa Valley, Oahu, August 1, 1916 (U. S.); *A. F. Judd 56,* near government road, Wahiawa, Oahu, July 19, 1926 (Bishop); *Mr. Pope 3,* Honolulu, Oahu, August, 1924 (Bishop).

17. Euphorbia Thymifolia L., Sp. Pl., p. 454. 1753.

Anisophyllum Thymifolium Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 25. 1860. (Various other synonyms omitted here.)

Annual herb; stems several or many, filiform, prostrate, very

much branched, curly-haired, mostly 1–2 dm. long. Leaves opposite, the petiole ±0.4 mm. long; blade oblong, at apex obtuse, at base suboblique, at margin serrulate-crenulate, glabrous or more often on lower surface appressedly hirtous, mostly 3–7 mm. long; stipules elongately lanceolate-subulate, hairy-fimbriate. Capitula axillary, mostly congested upon much-abbreviated axillary racemes. Involucre turbinate, outwardly appressed-hirtous but inwardly (except for the short and ciliolate lobes) glabrous, deeply cleft, under 1 mm. long; glands very minute, stipitate, ovate-rounded, with an equally wide or narrower and 2–3-lobulate appendage; pedicel usually less than half as long as involucre, sparsely hirsute. Capsule very shortly stipitate and even when young not cernuous, ovoid, appressed-hirtous, about 1 mm. tall; cocci obtusely carinate; styles distinct, slender, ±0.5 mm. long, deeply bifurcate. Seeds oblong-tetragonal, reddish, transversely 4–5-sulcate, about 0.6 mm. long.

Type: See discussion.

Distribution: Adventive from the Old World; known only from Oahu and Kauai.

Specimens examined: *Abbé Urbain Faurie 488 pro parte*, Kapoho, Kauai, May, 1909 (Delessert; a second sheet of this number is of true *E. prostrata); D. Wesley Garber 5*, Old Naval Station, Honolulu, Oahu, October 16, 1919 (Bishop).

Most material heretofore referred to *E. Thymifolia* is seen to belong to *E. prostrata.* The *Garber* material, however, was very kindly submitted for me by Sir Arthur W. Hill, Director of the Royal Botanical Gardens of Kew, to Dr. J. Hutchinson of the Kew Herbarium, and Sir Arthur now writes: "The *Euphorbia* . . . has been compared very carefully with the type of *Euphorbia Thymifolia* L. in the Linnean Herbarium at Burlington House, and with our Indian material, and Dr. Hutchinson considers it to be this species."

18. Euphorbia prostrata Aiton, Hort. Kew. **2**: 139. 1789. (For various synonyms see Boiss. *in* DC., Prodr. **15**, pt. 2: 47. 1862.)

Annual herb, stems several, prostrate, slenderly filiform, alternately branched, puberulous with minute curved hairs

on upper (dorsal) side at least along median line, glabrous beneath (ventrally), 0.5–2 dm. long. Leaves opposite, petiole glabrous and ±1 mm. long; blade oblong to elliptic or slightly oblong-obovate, at apex obtuse to rounded, at base oblique, at margin distinctly or obsoletely denticulate and sometimes ciliate, glabrous on both surfaces or on lower surface sparsely puberulous especially toward apex, 2–6 mm. long; stipules on upper side of stem usually distinct linear and pilose, those on lower side united into one deltoid or deltoid-ovate body, this apically laciniate-toothed. Capitula in short axillary leafy racemiform clusters, with 1 axillary capitulum to each pair of reduced leaves; or clusters at times reduced, with 1–3 capitula on a short peduncle, and with 1–3 pairs of minute spatulate leaves. Involucre campanulate or elongate-turbinate, glabrous or very slightly puberulous, 0.5–0.65 mm. long; glands 4, minute, suborbiculate, appendage very narrow or obsolete; lobes 5, ovate, pectinate-ciliate; pedicel glabrous, 0.5–1 (here and there one up to 2.5) mm. long. Capsule cernuous, subovate-orbiculate in side view, along and sometimes near the acute angles whitish-ciliate, otherwise mostly very glabrous, about 1.1–1.2 mm. tall; styles distinct, exceedingly short (only about 0.15 mm. long), deeply bifurcate, the branches thickened at apex. Seeds narrowly ovoid, truncate at base, obtuse at apex, tetragonal, at first reddish but finally grayish, ±0.8 mm. long, the faces transversely 5–7-sulcate.

Type specimen: Cultivated by Philip Miller in 1758, from seed obtained in the West Indies. Not seen by me but probably still extant (British or Kew).

Distribution: Native of tropical America but now widely spread in other warm parts of the earth; in Hawaiian Islands found on Kauai, Oahu, Lanai, West Maui, Kahoolawe, and doubtless elsewhere.

Specimens examined: *Abbé Urbain Faurie 486,* in fields, Honolulu, Oahu, April, 1909 (Bishop; Paris); *Faurie 488 pro parte,* Kapoho, Kauai, May, 1909 (Delessert); *Charles N. Forbes,* Kahoolawe, February 10–March 10, 1913 (Bishop); *Forbes 83-M,* Napili, West Maui, May, 1910 (Bishop); *Forbes 1023-O,* Honolulu, Oahu, January 15, 1909 (Bishop; Missouri); *Amos Arthur Heller 1981,* Makiki, Oahu, March 21, 1895 (Field; Gray; Kew; Missouri; New York; Paris, 2 sheets; U. S.); *Albert S. Hitchcock 13717,* rocky soil near stream, Honolulu, Oahu, June

15, 1916 (U. S.); *George C. Munro 197* and *289*, Koele, Lanai, November 2, 1913 (Bishop); *John F. G. Stokes*, Popoia (islet near Kailua, Oahu), November, 1915 (Bishop).

Most of the material in the Hawaiian Islands which has passed heretofore for *Euphorbia Thymifolia* L. is referable to this species.

Section 2. POINSETTIA (Graham) Boissier

Sect. 2. POINSETTIA (Graham) Boissier *in* DC., Prodr. **15**, pt. 2: 10. 1862; genus *Poinsettia* Graham, Edinburgh New Philosoph. Journ. **20**: 412. 1836.

Our species introduced; erect annuals. Leaves entire, dentate, or sinuate, all or only upper ones opposite, the uppermost often colored, especially near base. Stipules reduced to small glands. Capitula in terminal clusters. Glands 3 or 4 or more, often solitary, somewhat cup-shaped; lobes 4 or 5, deeply fimbriate-toothed. Interfloral bracteoles fimbriate-lacerate. Seeds ecarunculate or very minutely carunculate.—Nos. 19–20.

19. Euphorbia heterophylla L., Sp. Pl., p. 453. 1753.

Euphorbia heterophylla var. *genuina* Boiss. *in* DC., Prodr. **15**, pt. 2: 72. 1862.

Poinsettia heterophylla Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 104. 1860.

Poinsettia Edwardsii Klotzsch & Garcke *ex* Klotzsch, *loc. cit. (fide Boiss., loc. cit.)*.

Only the upper leaves pandurate ..... *E. heterophylla*
Lower leaves mostly pandurate, upper ones commonly pandurate or querciform ..... var. *β. cyathophora*

Annual or at times biennial or perennial, erect, bright green, pubescent to subglabrous, 3–9 dm. tall; stem simple or branched, woody below, the branches ascending or lower ones spreading, leafy at their ends. Leaves alternate except for topmost ones, the slender petiole more often 1–4 cm. long; blade polymorphous, thin, commonly 3–8 cm. long, that for lower and median leaves ovate or rhombic-oblong or lanceolate-

linear, its margin entire or undulate or even irregularly dentate or sinuate; that for the upper or floral leaves broader and dentate or often panduriform and blotched with purple or red; stipules reduced to small glands. Inflorescence of corymbulose and somewhat dense cymes, these subtended by the uppermost leaves. Involucre campanulate or cup-shaped, glabrous, about 2–2.3 mm. tall; glands 1 or few, exappendiculate, substipitate, in sinuses of the 5 ovate to oblong fimbriate lobes; pedicel short (usually about 0.5–0.6 the involucre's length), glabrous. Capsule glabrous or minutely pubescent, cernuous on a short glabrous stipe, about 4 mm. tall and somewhat thicker; cocci plump, the keel a mere line. Seeds oblong-ovoid, subterete, blackish but densely covered with grayish-brown tubercles (the larger of these sometimes dilated and appearing somewhat crested), ecarinate.

Type: Not seen by me.

Distribution: In the United States from Illinois and Minnesota south to Florida and Texas; in Mexico, Central America, Bolivia, and various other warm regions; in the Hawaiian Islands apparently represented only by the variety *cyathophora.*

Specimens examined: None (that is, from Hawaiian Islands).

Probably not yet adventive in the Hawaiian Islands, although erroneously so cited by many authors. Thus, for example, Hillebrand remarked in 1888 (Fl. Haw. Isls., p. 398) that *Euphorbia heterophylla* L. had been collected by him many years before in the upper parts of Nuuanu, Oahu, but that he had not met with it since. Of the somewhat similar *E. geniculata* Ort. he wrote, "which showed itself in gardens of Honolulu before my departure." *Hillebrand 43,* labeled by him "*Euphorbia* (naturalized?) Nuuanu Valley Oahu," had been received at Kew in July, 1865, and was determined by someone as *E. heterophylla* L. Its strongly carinate seeds show it to be *E. geniculata,* however. And, from the fact that *E. geniculata* was reported by Hillebrand only as having shown itself in gardens at Honolulu before his departure (in 1871), it is clear that the Kew specimen must represent the basis of his citation of

E. heterophylla L. (the more so because his own herbarium as it is preserved today at Berlin is seen to lack a specimen of his *E. heterophylla,* indicating that he probably depended upon notes which he had taken long before).

Degener (Fl. Haw., June 30, 1932) misinterprets Hillebrand's *E. heterophylla* as referring in reality to the var. *cyathophora* (treated below). However, that variety differs sharply not only in its mostly pandurate leaves (the floral ones commonly purplish- or reddish-splotched) but in its more rounded, ecarinate seeds.

Euphorbia heterophylla var. β. **cyathophora** (Murray) Grisebach, Fl. Brit. West Ind., p. 54. 1859; *cf.* Boiss. *in* DC., Prodr. **15**, pt. 2: 72. 1862.

Euphorbia cyathophora Murray, Comm. Goett. **7**: 81, *tab. 1.* 1786.

Poinsettia cyathophora Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 104. 1860; Degener, Fl. Haw., description and plate, June 30, 1932.

Leaves mostly pandurate with 2 or 4 obtuse but often acutely tipped lobes, rarely some basal ones ovate, uppermost ones at times less pandurate and somewhat more querciform.

Type: Not seen by me but represented by the type plate (Murray, *loc. cit.).*

Distribution: Native of tropical America but now naturalized in various other warm parts of the earth; established in recent years on Oahu.

Specimens examined: *Otto Degener 2491,* roadside, Kaimuki, Oahu, February 3, 1928 (New York); *Degener 8008,* along coast in arid region, Waimea, Oahu, July 9, 1926 (Missouri; New York); *Charles N. Forbes 2443-O,* roadsides at Kaimuki, Oahu, April, 1917 (Bishop).

20. **Euphorbia geniculata** Ortega, Nov. Rar. Pl. Hort. Matr. Decad., p. 18. 1797. (For various synonyms see Boiss. *in* DC., Prodr. **15**, pt. 2: 72. 1862.)

Similar to *E. heterophylla,* but somewhat coarser; leaf blades not pandurate or quercine, mostly oblong or ovate (often subrhomboidally so), acute or acuminate at apex, entire

or obsoletely (sometimes near base definitely) dentate, floral ones not purplish- or reddish-splotched; involucre cylindric-turbinate, very shortly pedicellate; lobes 5–7, oblong-lanceolate; seeds slightly larger (about 3–3.2 mm. long), more angular and on outer face carinate, less densely tuberculate.

Type specimen: Not seen by me.

Distribution: Texas, northern Mexico, West Indies, etc. Now established on Hawaii, Oahu, Kauai (Waimea, *fide* Heller, Minn. Bot. Studs. **1**: 845. 1897), Niihau, and perhaps elsewhere.

Specimens examined: *Edwin H. Bryan, Jr.*, roadside weed, Schofield Road, Oahu, February 10, 1929 (New York); *Bryan 701*, side of trail, Hauula, Oahu, April 14, 1929 (Bishop); *Otto Degener 1635*, corn field, Manoa Valley, Honolulu, Oahu, September 25, 1922 (New York); *Abbé Urbain Faurie 475*, in gardens, Halawa, Hawaii, June, 1909 (Delessert; Paris); *Faurie 517*, Honolulu, Oahu, November, 1909 (Bishop; Paris); *Charles N. Forbes*, Nuuanu Valley, Oahu, March 21, 1909 (Bishop; Field; Missouri); *Forbes 1623-M*, Manawainui, south slope of Haleakala, Maui, March 3, 1920 (Field); *Forbes* (with *J. C. Bridwell) 2441-O*, Waiolae Iki, Oahu, March 2, 1917 (Bishop); *Amos Arthur Heller 2035*, Nuuanu, Oahu, March 29, 1895 (Cornell; Field, 2 sheets; Gray; Kew; Missouri; New York; U. S.); *Heller* (similarly) *2035*, same locality, November 6, 1895 (Paris); *Albert S. Hitchcock 13699*, Honolulu, Oahu, June 15, 1916 (U. S.); *E. P. Hume 55*, University of Hawaii Campus, Honolulu, November 15, 1930 (Bishop); *Dr. Charles F. Millspaugh 2586*, Oahu, September 12, 1911 (Field); *George C. Munro 453*, Honolulu, Oahu, 1916 (Bishop); *Munro 636*, Oahu, 1916 (Bishop); *Marie C. Neal*, roadside, Makiki Valley, Oahu, March 13, 1932 (Bishop); *Joseph F. Rock 780*, Punaluu station, Oahu, December 3–14, 1908 (Bishop); *Harold St. John 9999*, thicket, Uluhulu Gulch, Kaena, Oahu, November 3, 1929 (Bishop); *John F. G. Stokes*, south half of Niihau, January, 1912 (Bishop, 2 sheets, one of more hairy material).

Section 3. Tithymalus (Adanson) Boissier

Sect. 3. Tithymalus (Adanson) Boissier *in* DC., Prodr. **15**, pt. 2: 10. 1862; genus *Tithymalus* [Tournefort] Adanson, Familles des Plantes **2**: 355. 1763.

Ours a single, introduced species, with capitula in a terminal, umbelliform inflorescence; stipules absent; glands long-horned; cocci 2-wing-crested on back; seeds carunculate.—No. 21.

21. Euphorbia Peplus L., Sp. Pl., 456. 1753. (For various synonyms see Boiss. *in* DC., Prodr. **15**, pt. 2: 141. 1862; also

J. B. S. Norton, Ann. Rept. Mo. Bot. Gard. **11**: 113, *pl. 30.* 1900.)

Annual herb, stem erect or ascending, 1.5–3 dm. tall, many branches from the base and below the umbel, the lower branches often almost as high as the plant axis, striate. Cauline leaves opposite except for the verticillate ones subtending the umbel, petiolate, the slender petiole up to 1 cm. long; blade obovate to rotund, apically obtuse to truncate or retuse, basally cuneate-narrowed, extremely thin, crisped, 0.5–2.5 cm. long and 0.4–1.2 cm. wide; floral leaves (bracts) opposite, sessile, smaller, more or less ovate or slightly pandurate, basally somewhat oblique, obtuse at both ends, sometimes mucronate, 0.6–1.5 cm. long and 0.5–1 cm. wide. Stipules none. Umbel 3- or sometimes up to 5-rayed, then forking. Involucre campanulate, about 1 mm. tall; glands 4, crescentic, much prolonged at each end into a slender horn; lobes triangular-ovate, hispid-ciliate; pedicel short; stamens 10–15, exserted. Capsule globose-ovoid to rarely depressed-globose, glabrous, slightly cernuous, about 2 mm. tall, deeply 3-parted; cocci very narrowly alate-bicarinate on back; styles distinct, up to 0.5 mm. long, deeply bilobed. Seeds oblong or oblong-ovoid, whitish, about 1.3 mm. long and 0.8 mm. wide, subhexagonal, the two inner faces each with a large lengthwise depression, the four external faces each with 1–4 (mostly 3) commonly large shallow pits in longitudinal rows, sometimes additional pits between the rows, or even 6 rows; caruncle conical, white. (Description in small part from Norton, *loc cit.)*

Type: The Linnean concept was founded upon various earlier citations in literature.

Distribution: Native of Europe but now found elsewhere; in the Hawaiian Islands known from Hawaii, East Maui, and southern Kauai.

Specimens examined: *Otto Degener,* 17 miles along main road from Kohala toward Waimea, Hawaii, August 13, 1926 (New York); *Degener 9105,* pasture, Honokaa, Kohala, Hawaii, July 28, 1926 (New York); *Abbé Urbain Faurie 464,* fields, Koloa, Hawaii, June, 1909 (Bishop; Delessert; Paris); *Charles N. Forbes,* Makawao, East Maui, August, 1910 (Field; Missouri); *Forbes 202-H,* summit of Hualalai, Hawaii, June 19–21, 1911 (Bishop); *Forbes 1989-M,* Kanaio, south slope of Haleakala, East Maui, March 1, 1920 (Field); *Amos Arthur Heller,* along Hana-

pepe River near the Falls, Kauai, June 24–26, 1895 (Field); *Dr. William Hillebrand,* Kona, Hawaii (Berlin; U. S.); *Albert S. Hitchcock 14218,* ravine, alt. 3600 ft., Kukaiau Ranch, Hawaii, August 19, 1916 (U. S.); *Horace Mann & William T. Brigham 333,* high central plateau of Hawaii, 1864–1865 (Cornell); *Jules Remy 599, Hawaii,* 1851–1855 (Paris).

EXPLANATION OF PLATE

PLATE 2

Euphorbia Remyi var. *molesta* (first type sheet).

EXPLANATION OF PLATE

PLATE 3

Euphorbia halemanui (type).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 4

Euphorbia Celastroides var. *moomomiana* (first type sheet).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 5

Euphorbia Celastroides var. *kaenana (Degener, Hirai & Park 8038,* in Herb. Degener).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 6

Euphorbia Celastroides var. *halawana* (type).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 7

Euphorbia Celastroides var. *hanapepensis* (type).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 8

Euphorbia Celastroides var. *amplectens* (type).

EXPLANATION OF PLATE

PLATE 9

Euphorbia multiformis var. *tomentella* (type).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 10

Euphorbia Skottsbergii var. *kalaeloana* (first type sheet).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 11

Euphorbia Degeneri var. *molokaiensis* (type).